AIR RESOURCES AND CLIMATE APPENDIX

INTRODUCTION

This appendix contains tables and figures that provide additional air resource and climate information for the planning area. Explanations of the data are provided in Chapter 3, *Affected Environment*. Technical data presented in this appendix address climate, air quality, and air quality related values (AQRVs). The Bureau of Land Management (BLM) *Miles City Field Office Air Resource Management Plan: Adaptive Management Strategy for Oil and Gas Resources* (ARMP) is also included in this appendix and begins on page ARMP-1.

TABLES AND FIGURES

TABLE 1.
BAKER CO-OP STATION TEMPERATURE AND PRECIPITATION DATA (1948 TO 2005)

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Average Max. Temperature	31.0	34.4	43.8	60.4	67.7	76.7	90.7	88.2	76.5	59.5	44.6	33.7	**58.9**
Average Min. Temperature	9.4	12.0	21.4	33.4	42.1	51.7	61.0	57.8	46.8	32.6	19.7	11.8	**33.3**
Average Total Precipitation	0.42	0.38	0.56	1.28	1.90	3.03	1.85	1.22	1.34	1.00	0.49	0.40	**13.87**
Average Total Snow Fall	4.8	4.0	4.9	3.1	0.9	0.1	0.0	0.0	0.4	1.0	3.5	4.7	**27.4**
Average Snow Depth	4	4	2	0	0	0	0	0	0	0	1	2	**1**

Source: DRI and NOAA 2010c
Baker: Co-op station 240412
Period of Record: 01 July 1948 through 31 December 2005
Elevation: 2933 feet, 46°22'N / 104°17'W
Temperature: degrees Fahrenheit; precipitation, snowfall, and snow depth: inches

TABLE 2.
BROADUS CO-OP STATION TEMPERATURE AND PRECIPITATION DATA (1948 TO 2005)

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Average Max. Temperature	32.1	38.7	46.5	58.7	68.7	78.3	87.4	86.3	74.5	62.2	45.6	35.6	**59.6**
Average Min. Temperature	6.5	13.1	20.5	31.0	41.2	50.3	56.0	53.5	42.3	31.3	19.4	10.2	**31.3**
Average Total Precipitation	0.47	0.45	0.77	1.45	2.22	2.43	1.52	1.02	1.09	1.01	0.58	0.48	**13.49**
Average Total Snow Fall	6.5	5.7	7.4	4.4	1.2	0.1	0.0	0.0	0.5	2.2	5.6	7.0	**40.6**
Average Snow Depth	3	3	1	0	0	0	0	0	0	0	1	2	**1**

Source: DRI and NOAA 2010d
Broadus: Co-op station 241127
Period of Record: 01 July 1948 through 31 December 2005
Elevation: 3032 feet, 45°27'N / 105°24'W
Temperature: degrees Fahrenheit; precipitation, snowfall, and snow depth: inches

TABLE 3.
GLENDIVE CO-OP STATION TEMPERATURE AND PRECIPITATION DATA (1905 TO 2005)

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Average Max. Temperature	26.1	31.3	43.0	60.0	71.2	80.1	88.9	87.7	75.5	62.2	43.2	31.0	**58.4**
Average Min. Temperature	3.8	7.7	18.9	32.9	43.6	53.0	58.7	55.9	44.7	33.7	20.7	9.6	**31.9**
Average Total Precipitation	0.45	0.37	0.66	1.15	2.03	3.12	1.83	1.37	1.20	0.84	0.46	0.45	**13.93**
Average Total Snow Fall	6.0	4.6	5.7	1.9	0.4	0.0	0.0	0.0	0.1	1.2	3.6	5.3	**28.8**
Average Snow Depth	4	3	1	0	0	0	0	0	0	0	1	2	**1**

Source: DRI and NOAA 2010e
Glendive: Co-op station 243581
Period of Record: 01 January 1893 through 31 December 2005
Elevation: 2076 feet, 47°06'N / 104°43'W
Temperature: degrees Fahrenheit; precipitation, snowfall, and snow depth: inches

TABLE 4.
JORDAN CO-OP STATION TEMPERATURE AND PRECIPITATION DATA (1905 TO 2005)

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Average Max. Temperature	28.8	34.5	45.3	59.7	70.4	79.7	89.6	88.3	76.0	62.9	44.7	33.5	**59.5**
Average Min. Temperature	2.8	7.7	18.4	30.0	40.1	49.4	55.2	52.3	41.4	30.6	17.9	7.9	**29.5**
Average Total Precipitation	0.45	0.32	0.54	1.03	1.81	2.5	1.55	1.09	0.98	0.73	0.34	0.42	**11.74**
Average Total Snow Fall	3.1	3.1	1.3	0.5	0.2	0.0	0.0	0.0	0.1	0.0	0.9	1.8	**11.0**
Average Snow Depth	3	2	1	0	0	0	0	0	0	0	0	1	**1**

Source: DRI and NOAA 2010f
Jordan: Co-op station 244522
Period of Record: 01 January 1905 through 31 December 2005
Elevation: 2620 feet, 47°19'N / 106°55'W
Temperature: degrees Fahrenheit; precipitation, snowfall, and snow depth: inches

TABLE 5.
LAME DEER CO-OP STATION TEMPERATURE AND PRECIPITATION DATA (1948 TO 1998)

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Average Max. Temperature	33.7	41.0	48.3	60.6	70.4	79.5	89.2	89.0	77.3	64.5	46.3	36.7	**61.4**
Average Min. Temperature	4.9	11.4	18.9	27.9	37.8	46.0	50.8	48.9	38.6	28.9	18.5	9.0	**28.5**
Average Total Precipitation	0.53	0.59	0.85	1.48	2.69	2.63	1.33	1.06	1.26	1.16	0.77	0.64	**14.98**
Average Total Snow Fall	9.5	7.3	8.0	4.6	0.3	0.3	0.0	0.1	0.4	1.4	6.3	8.2	**46.3**
Average Snow Depth	6	4	1	0	0	0	0	0	0	0	1	3	**1**

Source: DRI and NOAA 2010g
Lame Deer: Co-op station 244839
Period of Record: 01 July 1948 through 31 May 1998
Elevation: 3300 feet, 45°38'N / 106°40'W
Temperature: degrees Fahrenheit; precipitation, snowfall, and snow depth: inches

TABLE 6.
MILES CITY FAA AIRPORT TEMPERATURE AND PRECIPITATION DATA (1937 TO 2005)

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Average Max. Temperature	27.3	33.7	44.0	58.4	69.3	78.6	88.8	87.2	74.3	61.1	42.8	32.2	**58.1**
Average Min. Temperature	6.8	11.9	21.3	33.6	44.1	53.2	60.1	58.2	46.8	35.5	21.6	11.7	**33.7**
Average Total Precipitation	0.45	0.39	0.62	1.28	2.09	2.89	1.58	1.13	1.14	0.95	0.47	0.43	**13.43**
Average Total Snow Fall	5.8	4.6	4.7	3.3	0.7	0.0	0.0	0.0	0.3	1.2	4.2	5.1	**29.9**
Average Snow Depth	5	6	3	1	0	0	0	0	0	0	1	4	**2**

Source: DRI and NOAA 2010m
Miles City FAA Airport: Co-op station 245690
Period of Record: 16 January 1937 through 31 December 2005
Elevation: 2624 feet, 46°26'N / 105°53'W
Temperature: degrees Fahrenheit; precipitation, snowfall, and snow depth: inches

TABLE 7.
SIDNEY CO-OP STATION TEMPERATURE AND PRECIPITATION DATA (1910 TO 2005)

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Average Max. Temperature	23.0	30.3	41.4	58.5	69.9	78.1	84.9	84.1	72.3	59.6	40.9	28.7	**56.0**
Average Min. Temperature	1.0	7.7	17.2	30.2	41.4	50.4	54.9	52.7	42.5	32.1	18.8	7.5	**29.7**
Average Total Precipitation	0.40	0.35	0.55	1.09	1.97	2.82	2.11	1.45	1.34	0.95	0.48	0.41	**13.91**
Average Total Snow Fall	6.2	5.2	5.1	2.6	0.7	0.0	0.0	0.0	0.3	1.5	5.1	6.3	**33.0**
Average Snow Depth	5	4	2	0	0	0	0	0	0	0	1	2	**1**

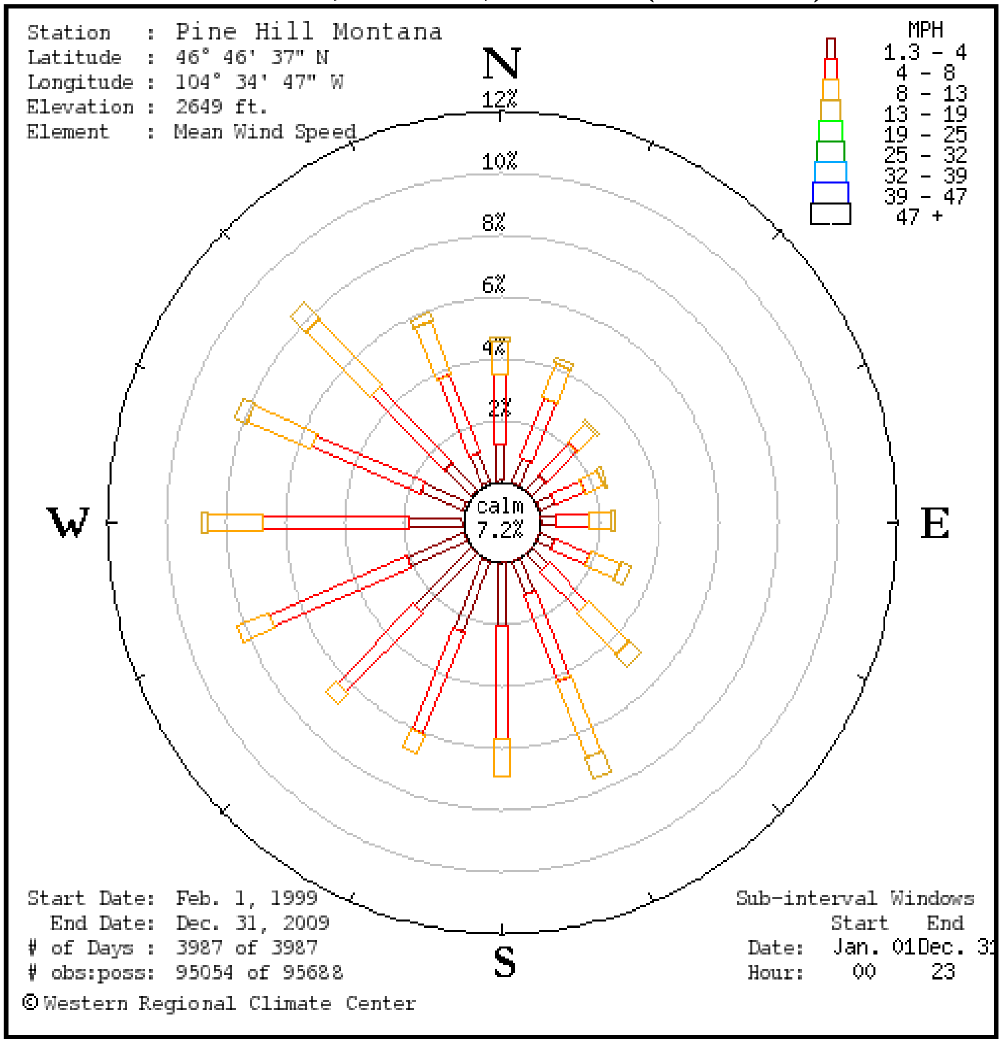
Source: DRI and NOAA 2010p
Sidney: Co-op station 247560
Period of Record: 16 October 1910 through 31 December 2005; Elevation: 1931 feet, 47°44'N / 104°09'W; Temperature: degrees Fahrenheit; precipitation, snowfall, and snow depth: inches

TABLE 8.
HOURLY WIND DATA FROM STATIONS IN THE PLANNING AREA

Month	Station									
	Baker (1998 to 2006)		Glendive (1996 to 2006)		Jordan (1996 to 2006)		Miles City (1996 to 2006)		Sidney (1996 to 2006)	
	Direction[1]	Speed	Direction	Speed	Direction	Speed	Direction	Speed	Direction	Speed
Jan.	W	10.4	S	9.5	W	7.3	S	8.8	SSW	8.9
Feb.	W	10.5	S	9.7	W	7.9	S	9.4	S	9.0
March	SE	12.2	S	10.5	W	9.3	NW	10.6	S	9.5
April	SE	12.5	NW	11.3	W	10.0	NW	11.2	N	10.2
May	W	12.7	NW	11.6	W	10.5	NW	11.3	S	10.4
June	W	11.7	W	10.4	W	9.7	NW	10.5	S	9.0
July	SE	10.7	NW	9.4	W	8.4	NW	9.9	S	7.7
Aug.	SE	10.8	S	9.6	W	8.4	SSE	9.7	S	7.9
Sept.	ESE	10.0	NW	9.6	W	8.2	NW	9.7	S	8.2
Oct	W	10.3	S	10.1	W	8.2	S	9.7	S	8.8
Nov.	W	10.5	S	9.7	W	7.9	S	9.3	SSW	8.7
Dec.	W	10.7	S	10.2	W	8.1	S	9.3	SSW	9.4
Annual	**W**	**11.1**	**S**	**10.1**	**W**	**8.6**	**NW**	**9.9**	**S**	**9.0**

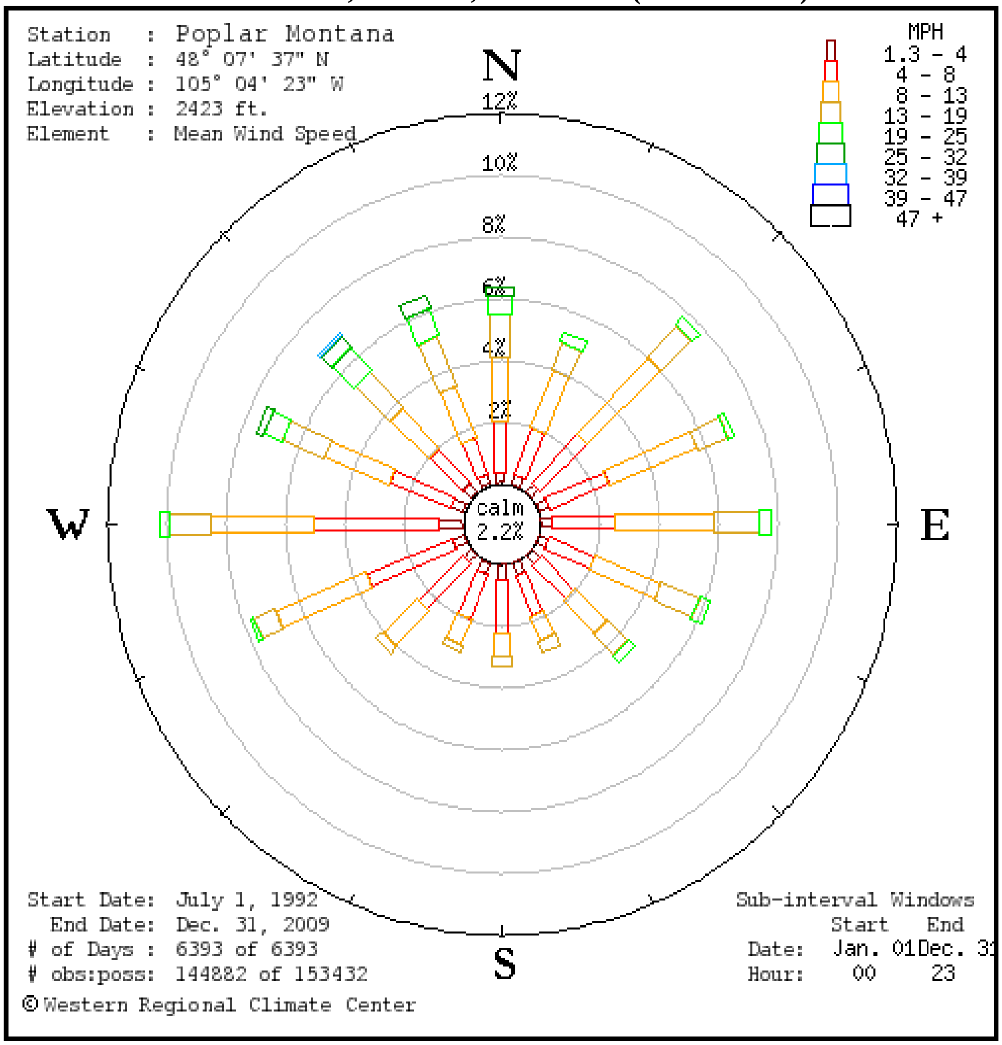
Source: DRI and NOAA 2010a and 2010b
[1]The wind direction was defined as the direction with the highest frequency (percent) from the direction of origin in mph.
The data were derived from hourly measurement during the 1996 to 2006 period, although the measurement periods varied depending on the site as noted. Although some generalities can be considered, since these data were collected at airports with few obstructions for aviation safety, these data may not be representative of a particular region.

FIGURE 1.
WIND ROSE, PINE HILL, MONTANA (1999 TO 2009)



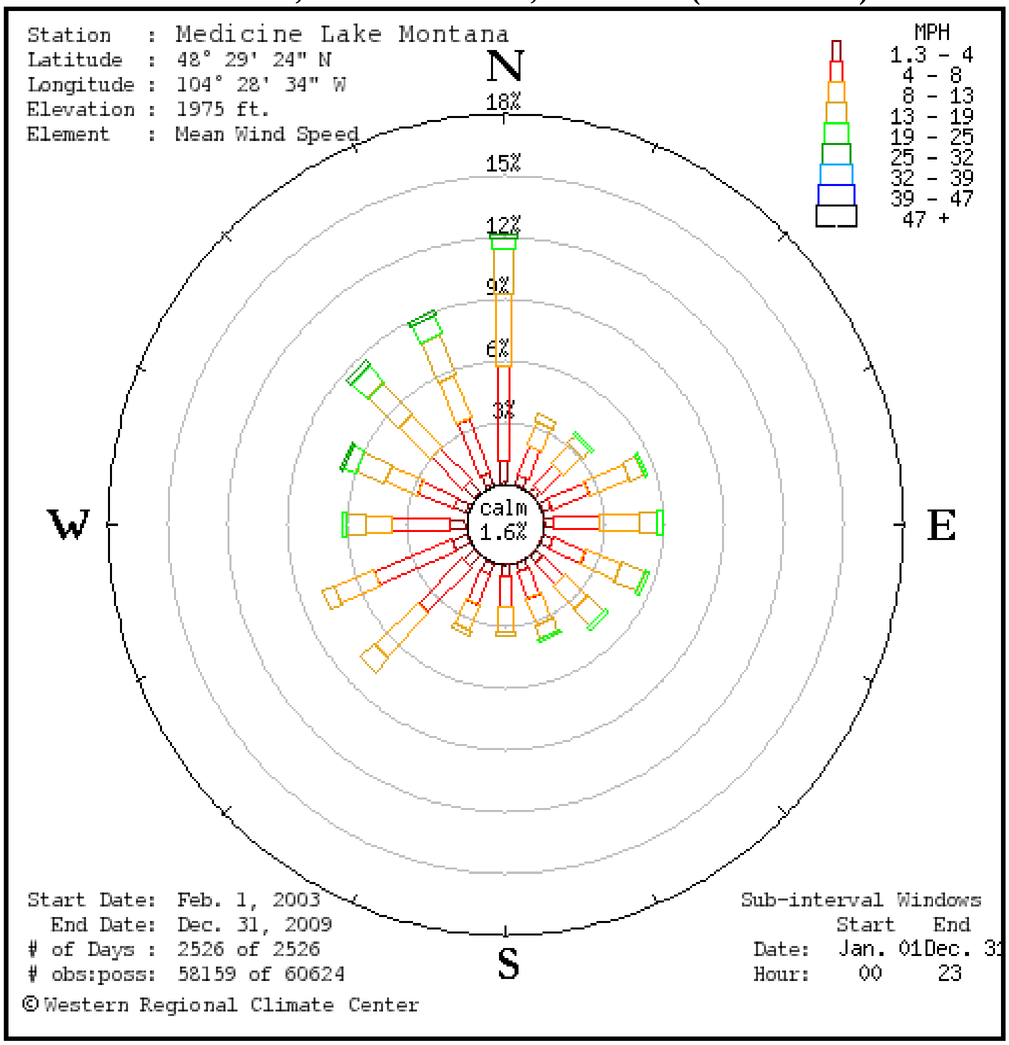
Source: DRI and NOAA 2010n

FIGURE 2.
WIND ROSE, POPLAR, MONTANA (1992 TO 2009)



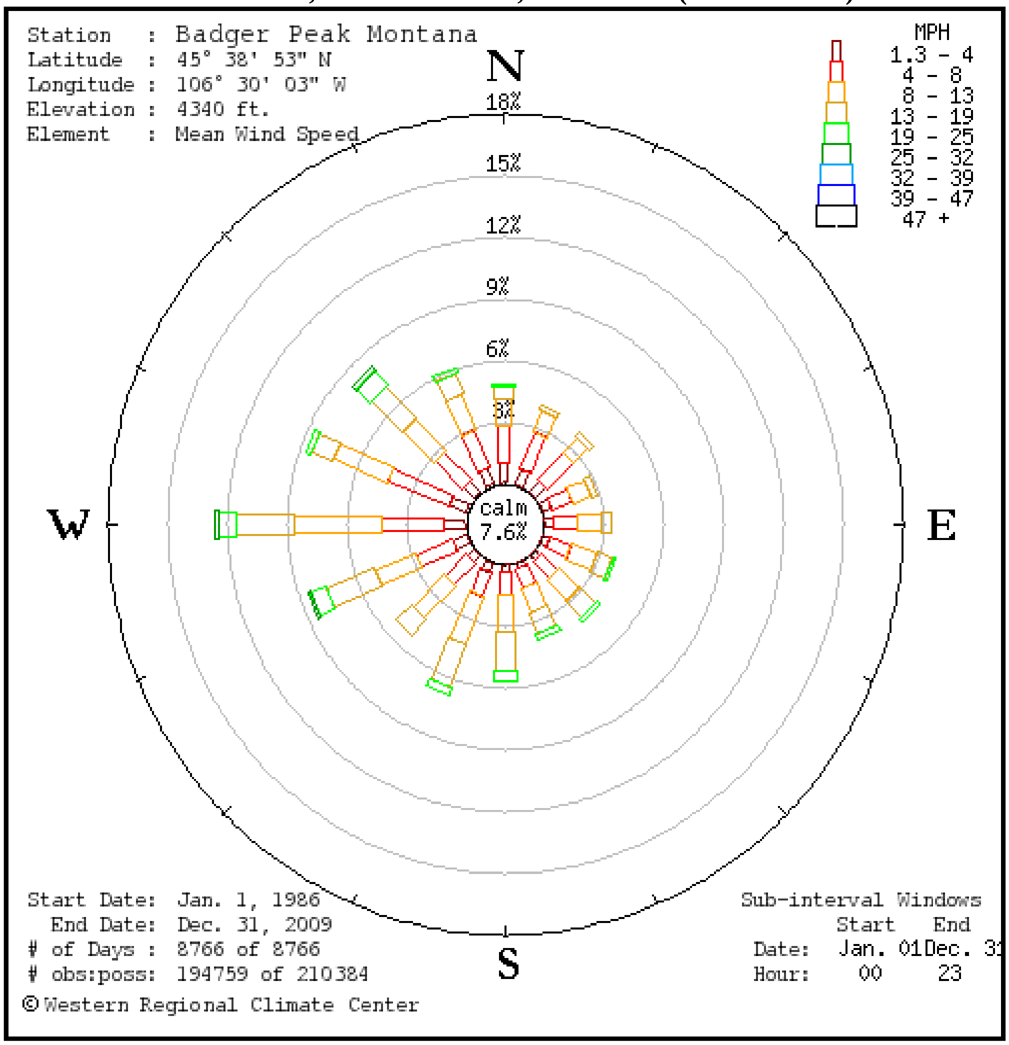
Source: DRI and NOAA 2010o

FIGURE 3.
WIND ROSE, MEDICINE LAKE, MONTANA (2003 TO 2009)



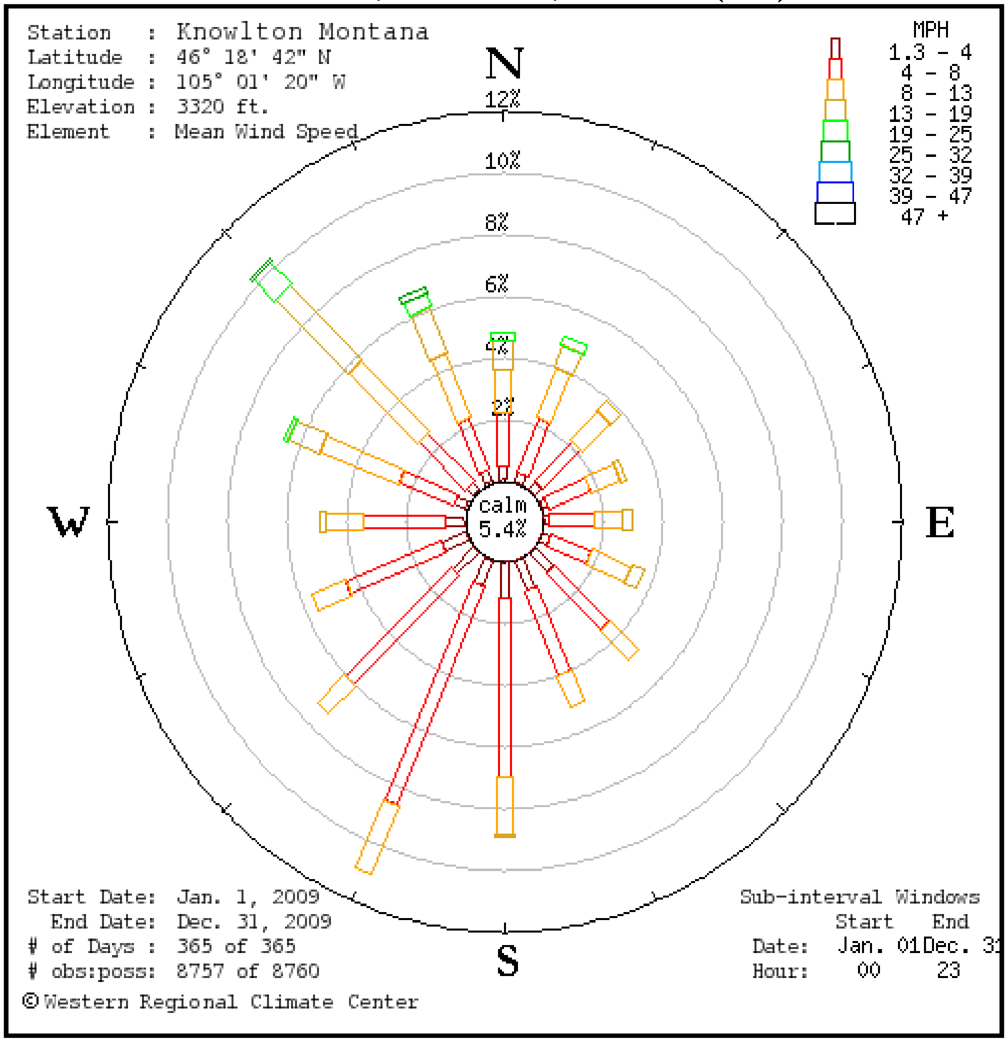
Source: DRI and NOAA 2010l

FIGURE 4.
WIND ROSE, BADGER PEAK, MONTANA (1986 TO 2009)



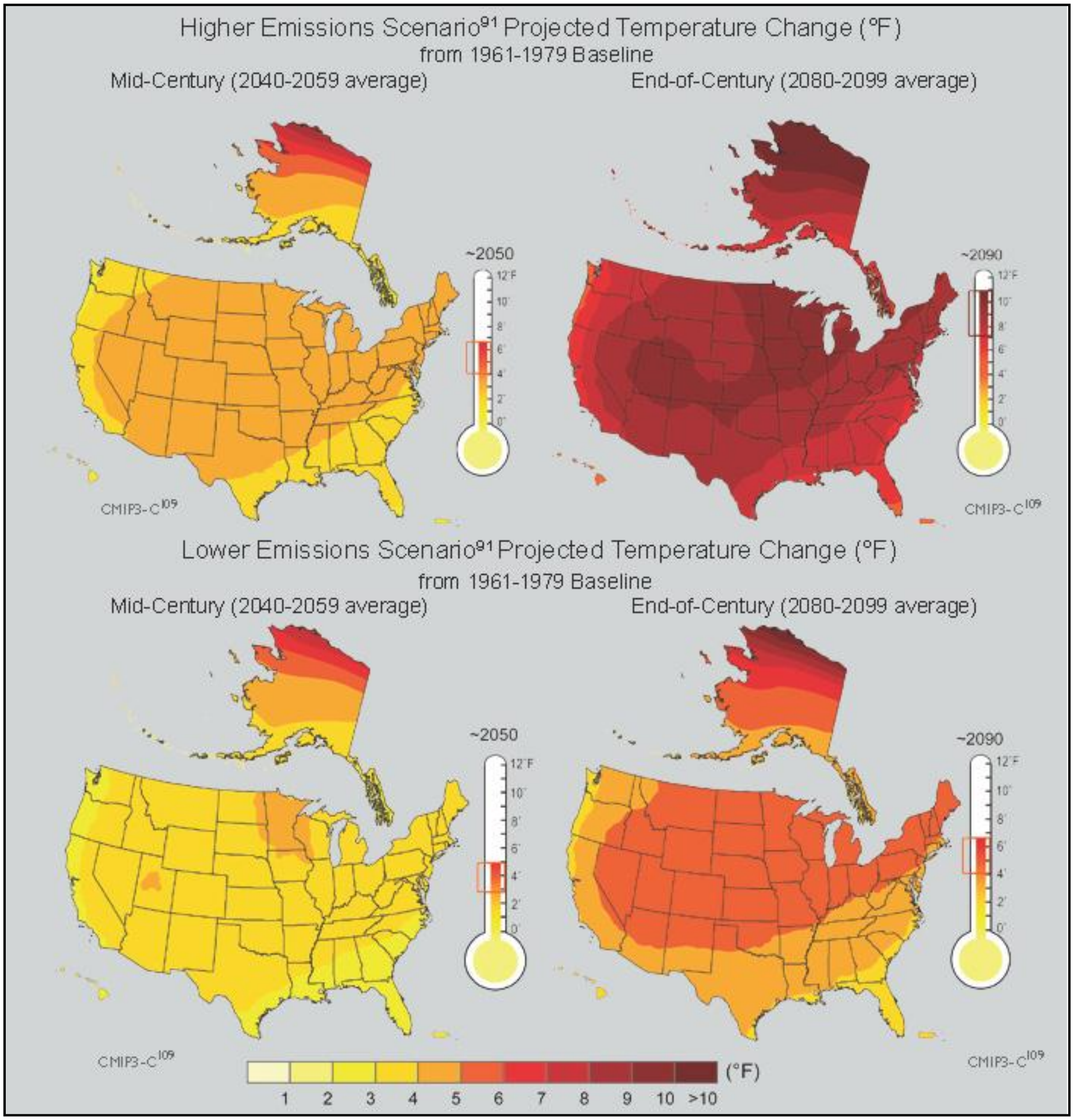
Source: DRI and NOAA 2010i

FIGURE 5.
WIND ROSE, KNOWLTON, MONTANA (2009)



Source: DRI and NOAA 2010k

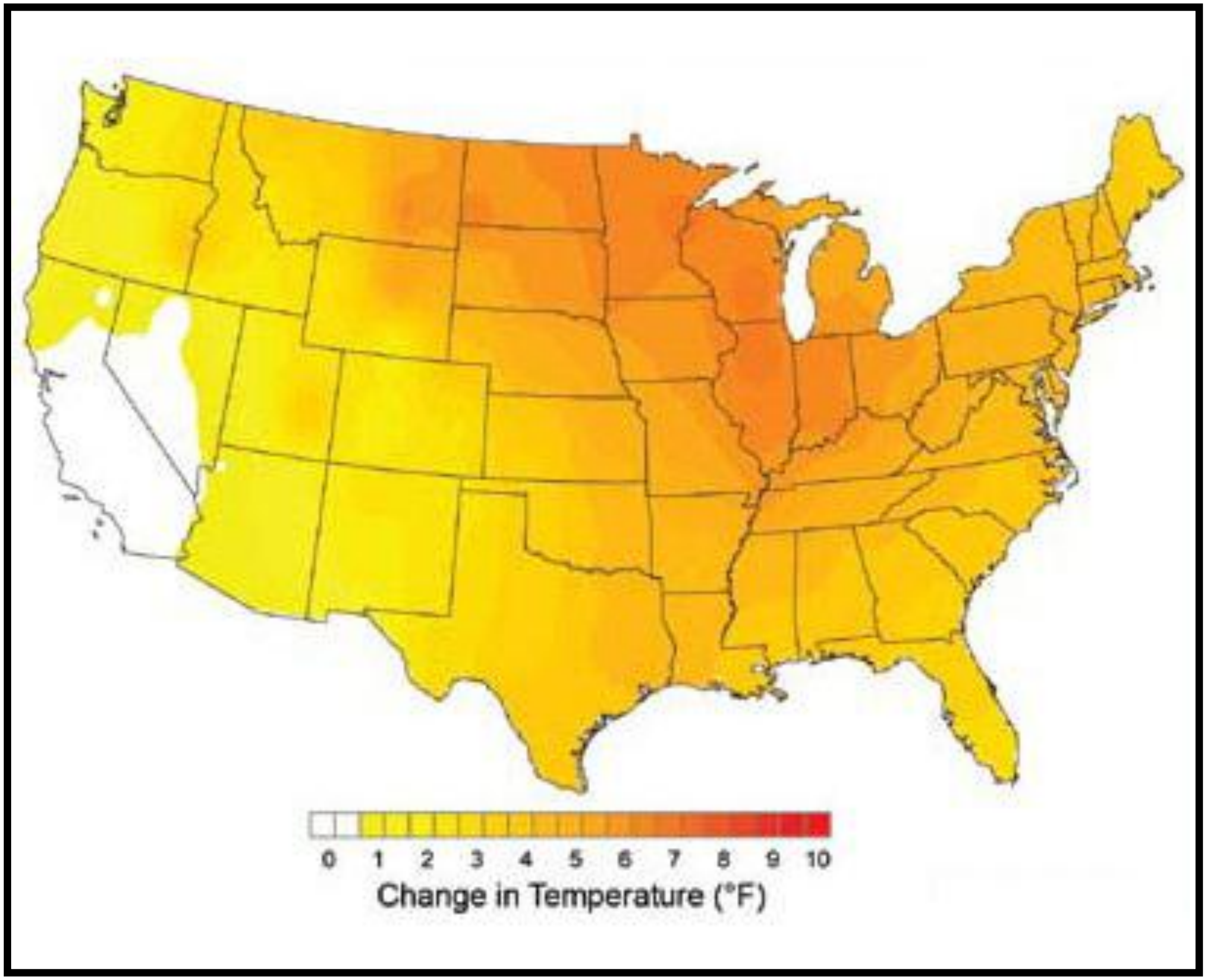
FIGURE 6.
PROJECTED UNITED STATES TEMPERATURE CHANGES FROM 1961 TO 1979 BASELINE



Source: USGCRP 2009

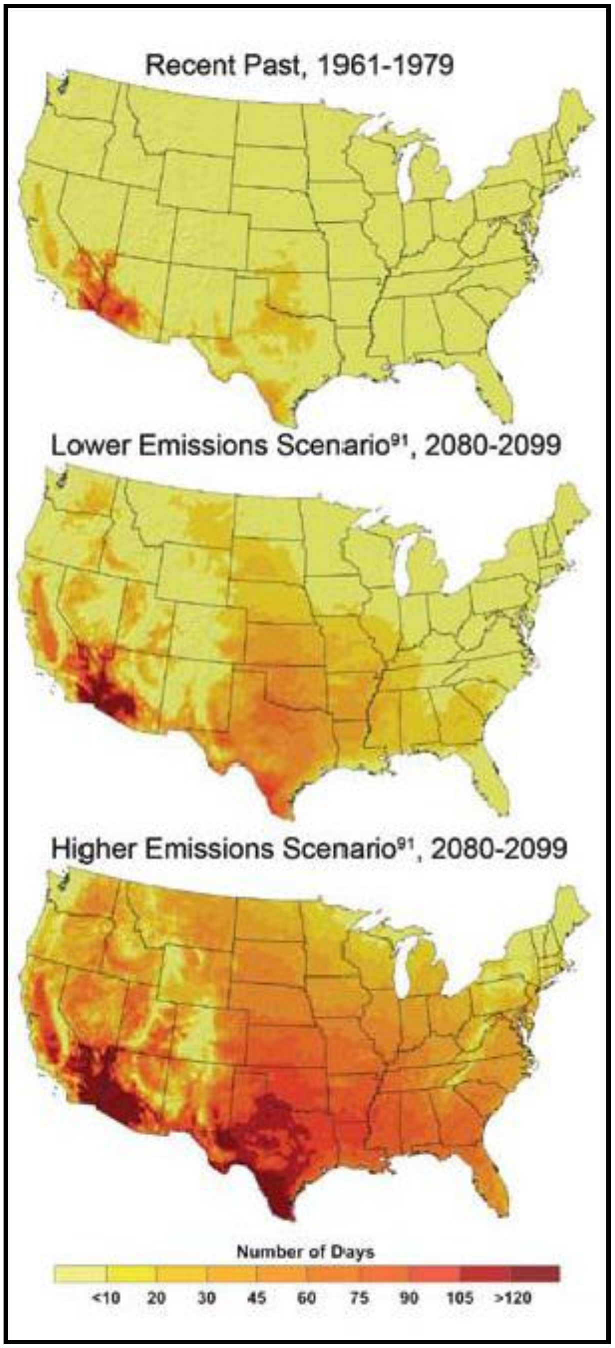
This figure is based on projections of future temperature by 16 of the Coupled Model Intercomparison Project Three (CMIP3) climate models using two emissions scenarios from the Intergovernmental Panel on Climate Change (IPCC), Special Report on Emission Scenarios. The higher emission scenario is shown in the top half of the figure, while the lower emission scenario is shown in the bottom half. Temperature predictions for the middle of the 21st century are shown on the left, with end-of-century predictions shown on the right. The brackets on the thermometers represent the likely range of model projections, though lower or higher outcomes are possible.

FIGURE 7.
UNITED STATES WINTER TEMPERATURE TRENDS FROM 1975 TO 2007



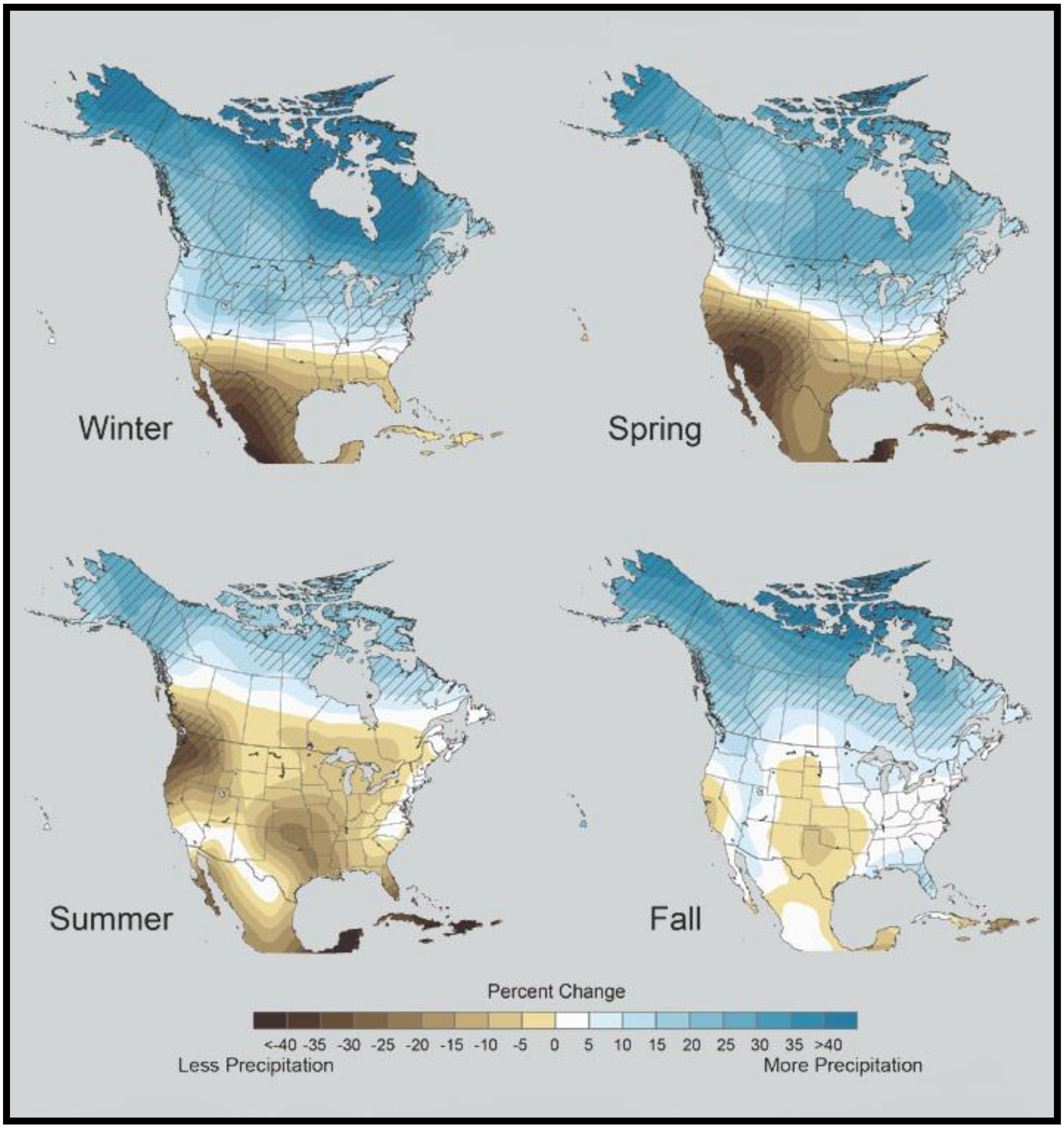
Source: USGCRP 2009

FIGURE 8.
PREDICTED NUMBER OF DAYS OVER 100 DEGREES FAHRENHEIT IN THE UNITED STATES



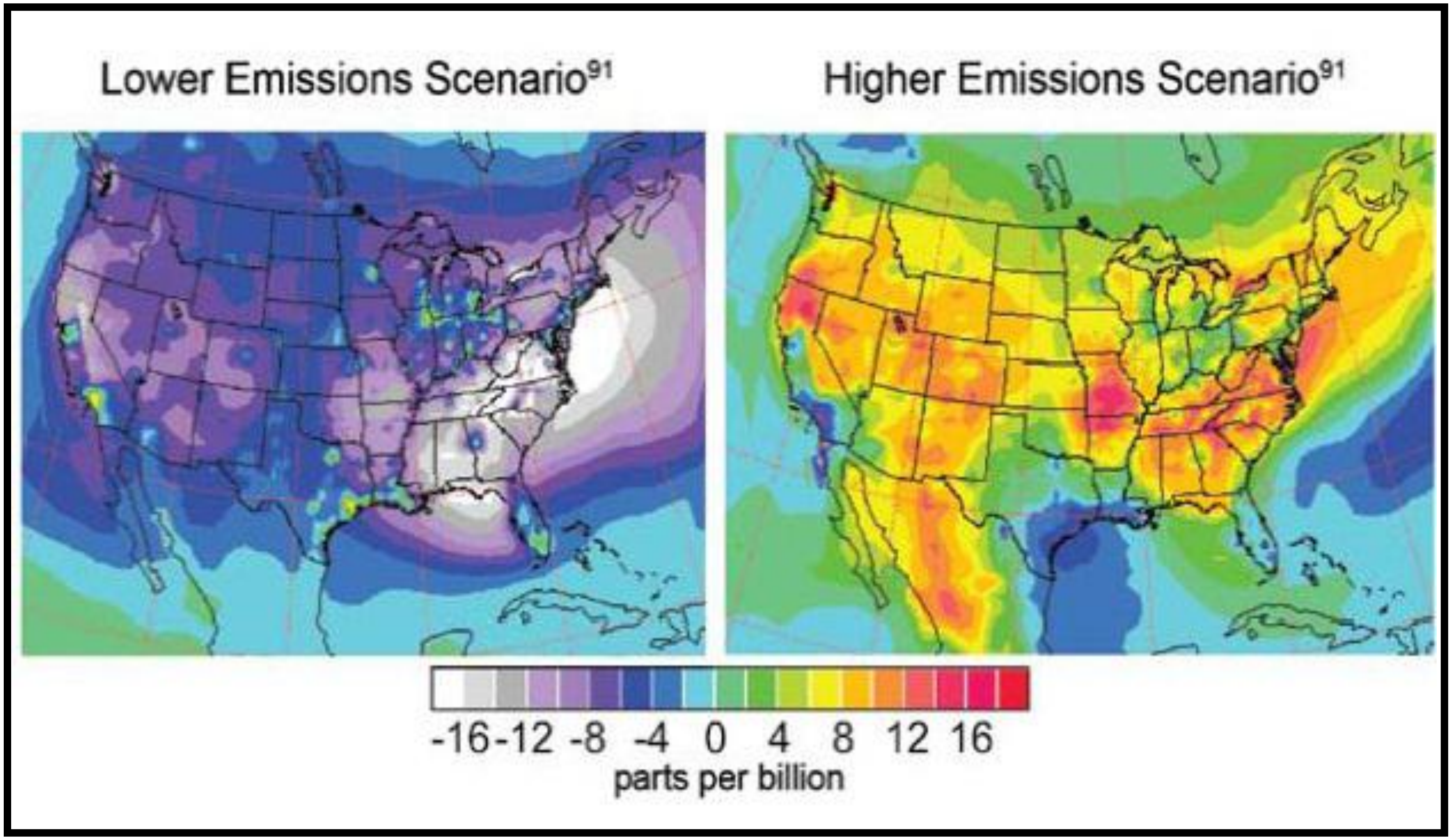
Source: USGCRP 2009

FIGURE 9.
PREDICTED SEASONAL CHANGES IN NORTH AMERICAN PRECIPITATION FROM 2080 TO 2099



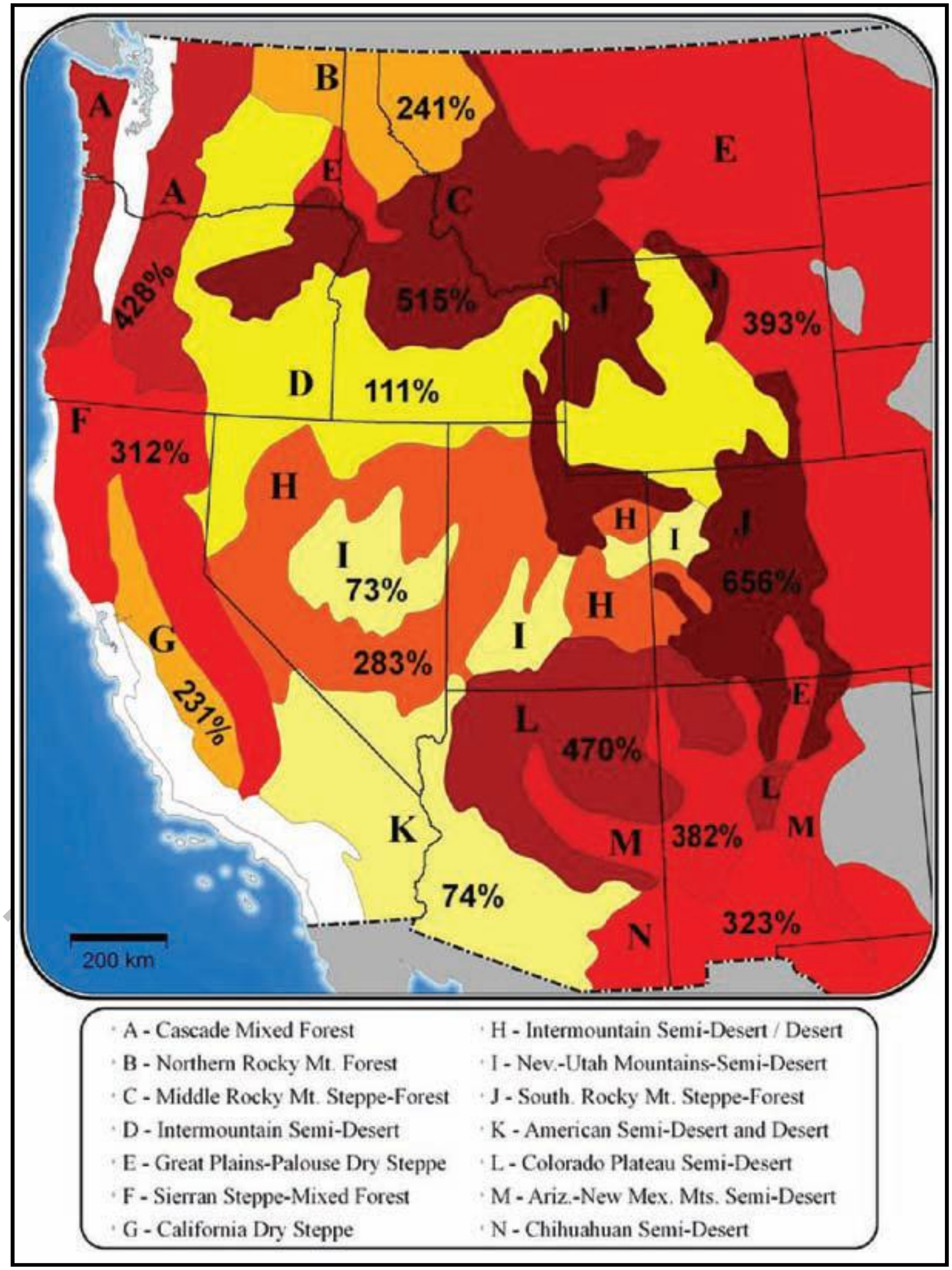
Source: USGCRP 2009

FIGURE 10.
PROJECTED CHANGE IN UNITED STATES GROUND-LEVEL OZONE IN THE 2090s



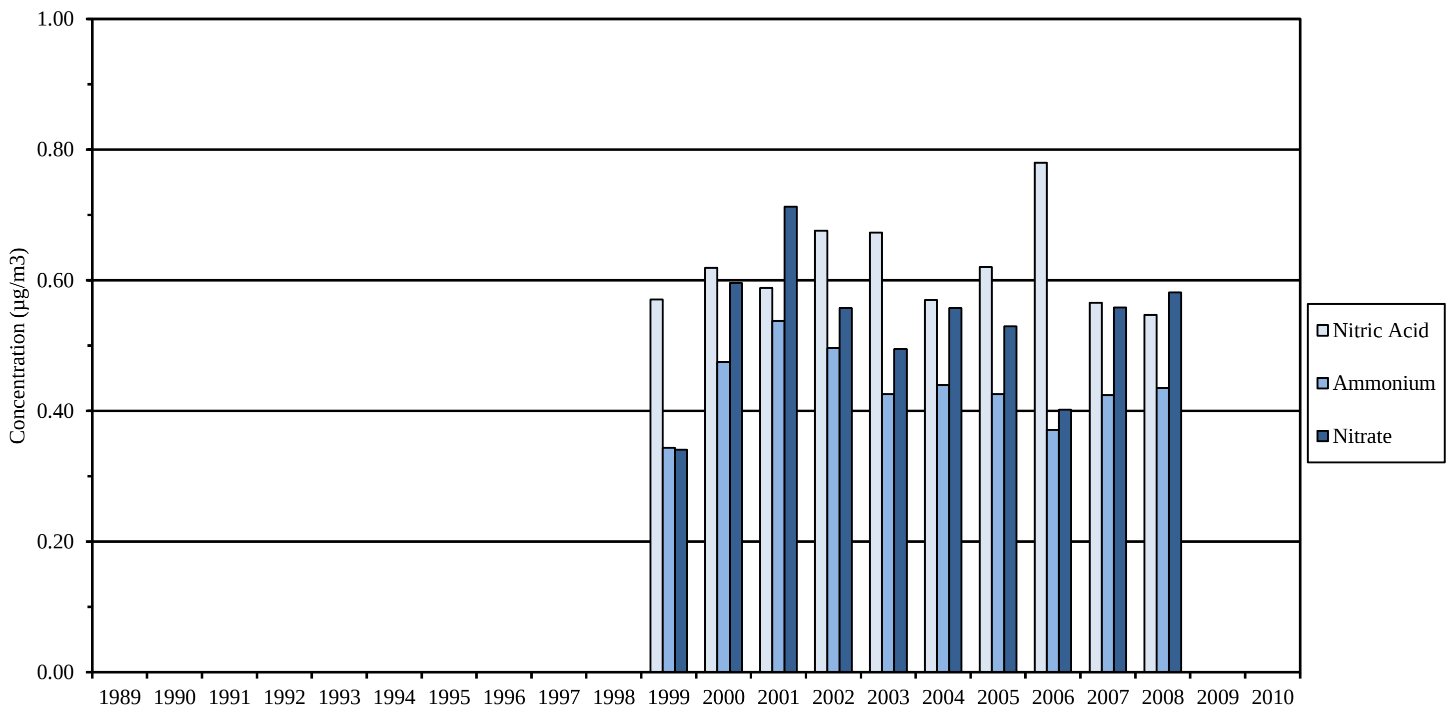
Source: USGCRP 2009

FIGURE 11.
PREDICTED CHANGES IN WILDFIRE AREA BURNED IN THE WESTERN UNITED STATES



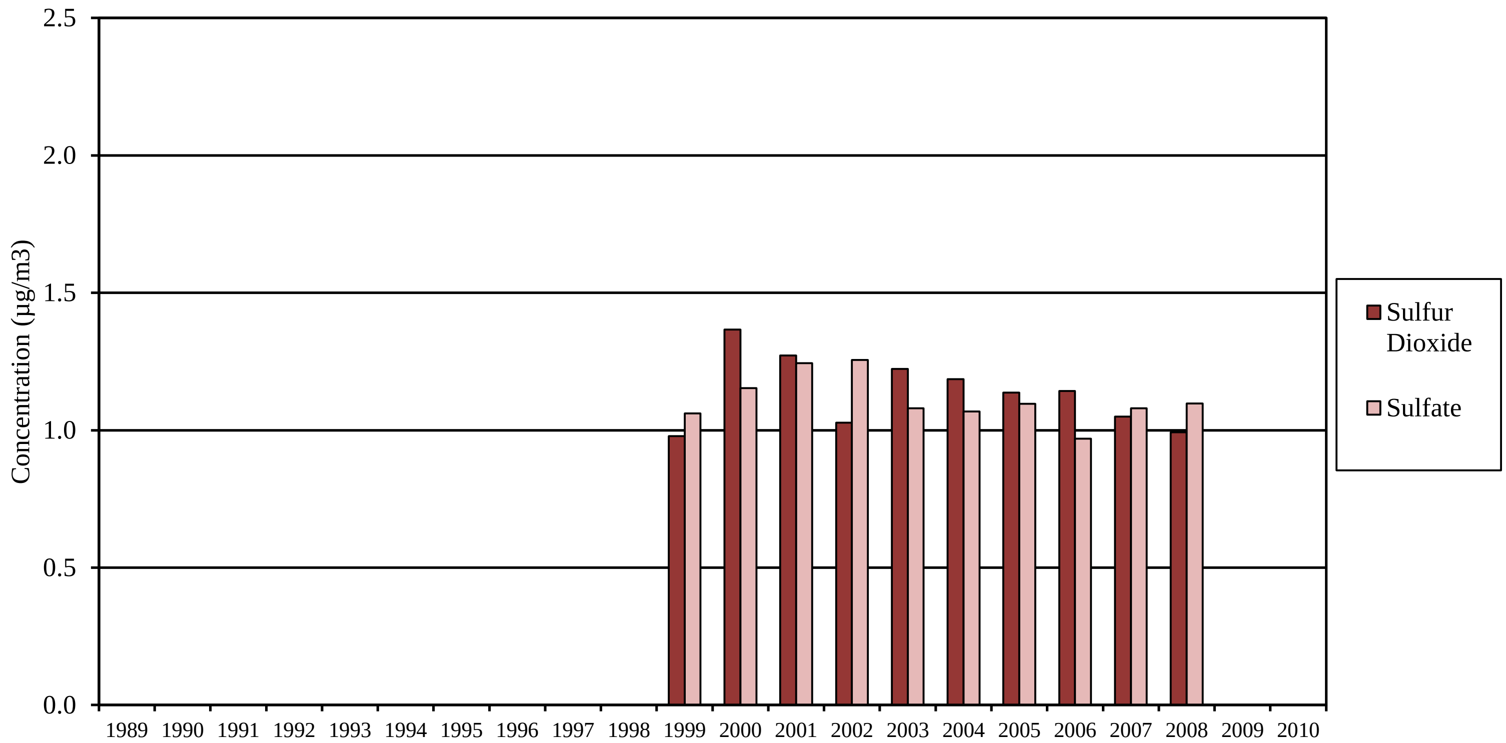
Source: NRC 2011

FIGURE 12.
MEAN ANNUAL CONCENTRATIONS OF NITROGEN COMPOUNDS IN THE MILES CITY STUDY AREA (THEODORE ROOSEVELT NATIONAL PARK)



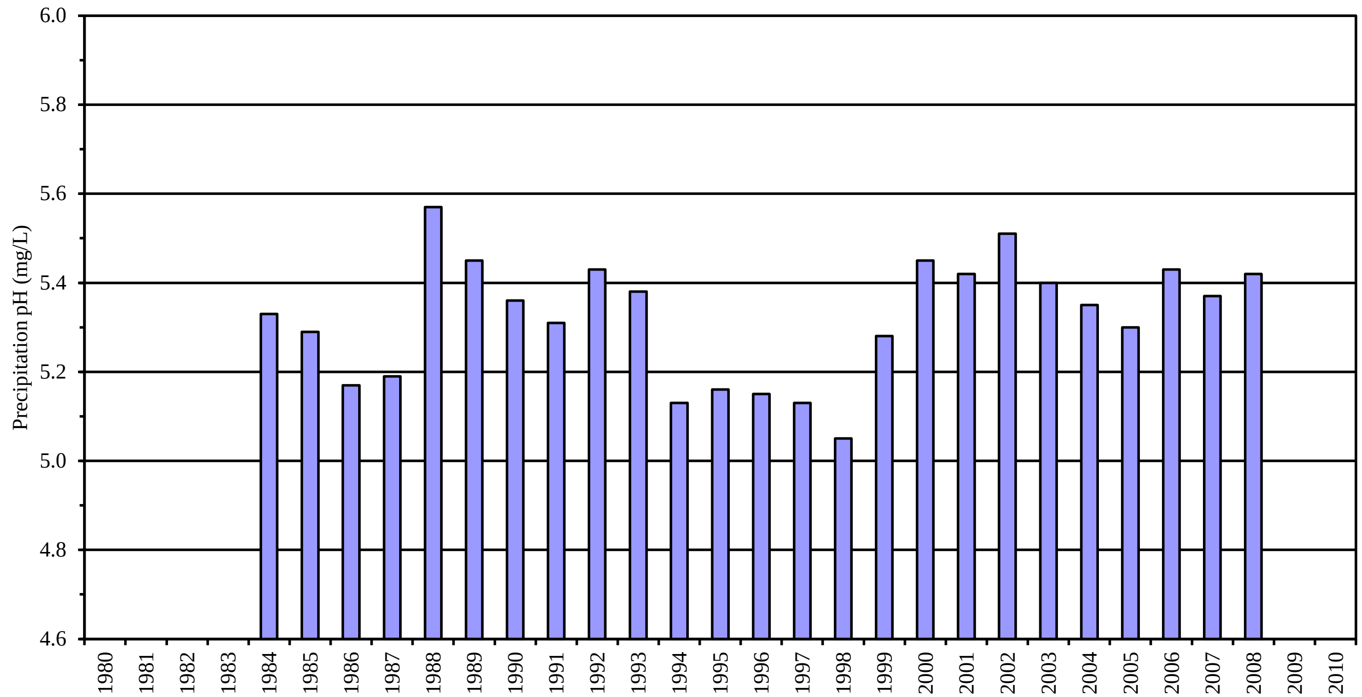
Clean Air Status and Trends Network (CASTNet)
CASTNet Theodore Roosevelt National Park station THR422
Typical concentrations for remote areas:
Nitric Acid (HNO3): 0.05 - 0.80 µg/m3
Ammmonium (NH4+): 0.20 µg/m3
Nitrate (NO3-): 0.50 µg/m3

FIGURE 13.
MEAN ANNUAL CONCENTRATIONS OF SULFUR COMPOUNDS IN THE MILES CITY STUDY AREA (THEODORE ROOSEVELT NATIONAL PARK)



Clean Air Status and Trends (CASTNet)
CASTNet Theodore Roosevelt National Park station: THR422
Typical concentrations for remote areas:
Sulfur Dioxide (SO2): 2.6 - 26 µg/m3
Sulfate (SO4-2): 2.5 µg/m3

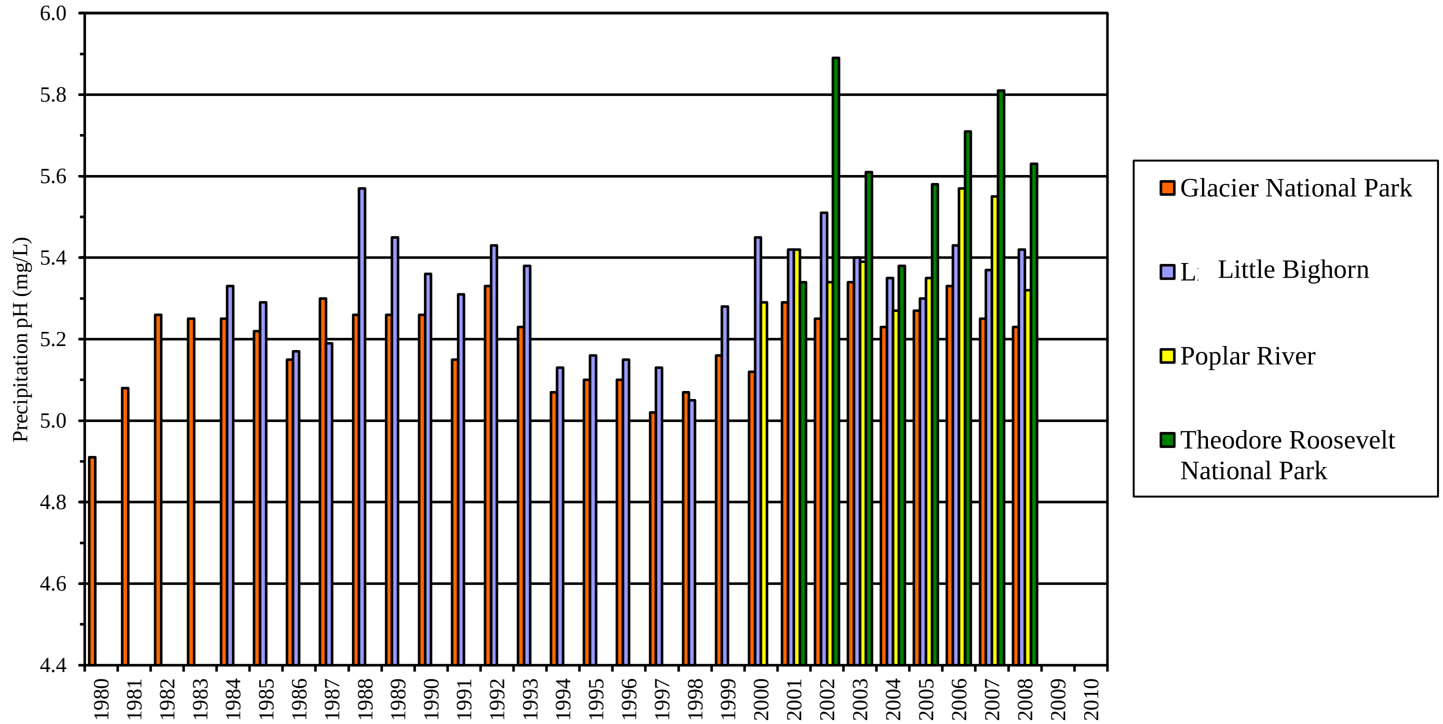
FIGURE 14.
MEAN ANNUAL PRECIPITATION PH REPRESENTING THE PLANNING AREA, LITTLE BIGHORN BATTLEFIELD



National Atmospheric Deposition Program (NADP)
Little Bighorn Battlefield National Monument NADP station MT00

Normal range of precipitation pH (mg/L): 5.0 - 5.6 (Seinfeld 1986)

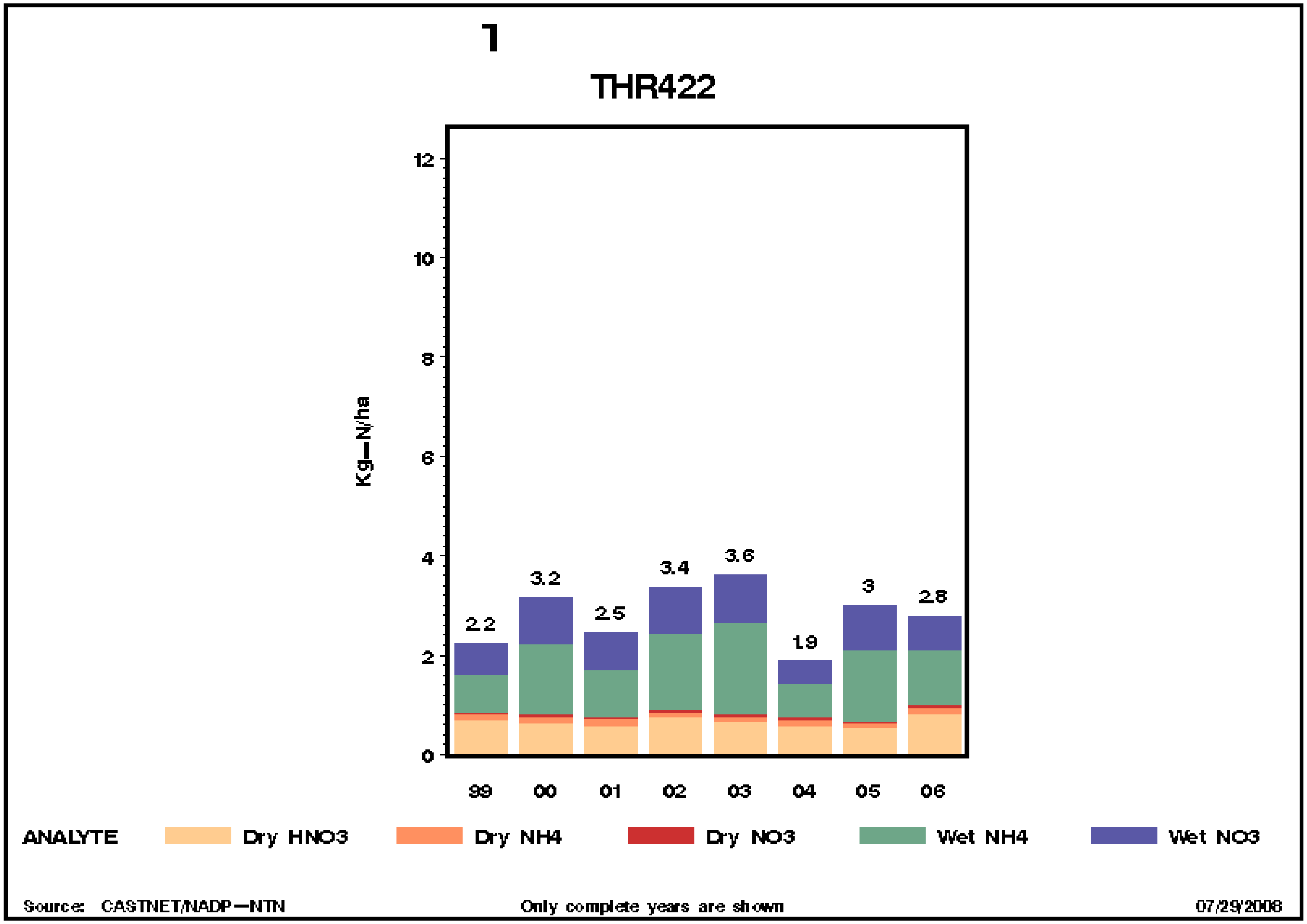
FIGURE 15.
MEAN ANNUAL PRECIPITATION PH REPRESENTING THE PLANNING AREA



National Atmospheric Deposition Program (NADP)
Glacier National Park NADP station MT05
Little Bighorn Battlefield National Monument NADP station MT00
Poplar River NADP station MT96
Theodore Roosevelt NADP station ND00

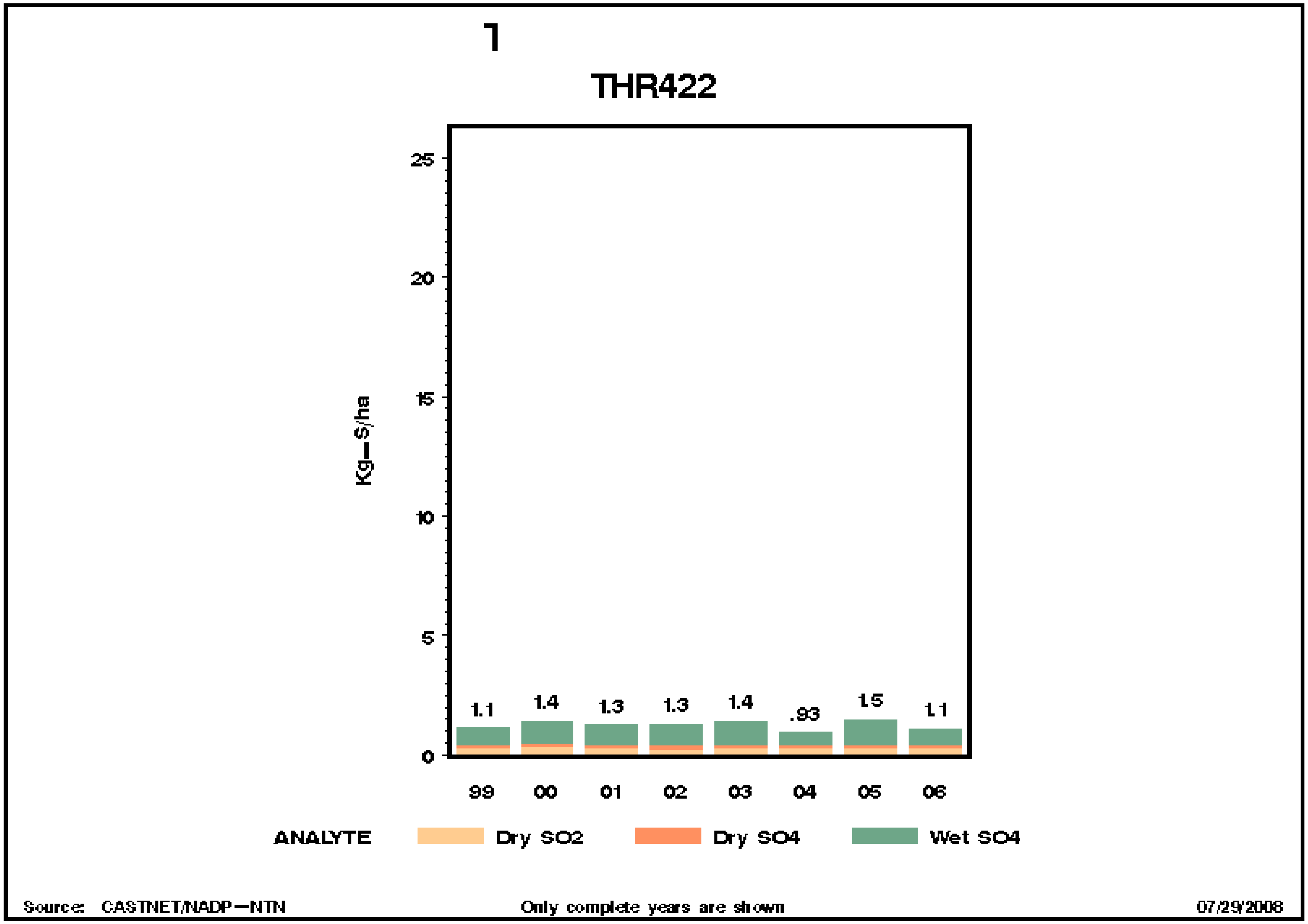
Normal range of precipitation pH (mg/L): 5.0 to 5.6 (Seinfeld 1986)

FIGURE 16.
TOTAL NITROGEN DEPOSITION IN THEODORE ROOSEVELT NATIONAL PARK



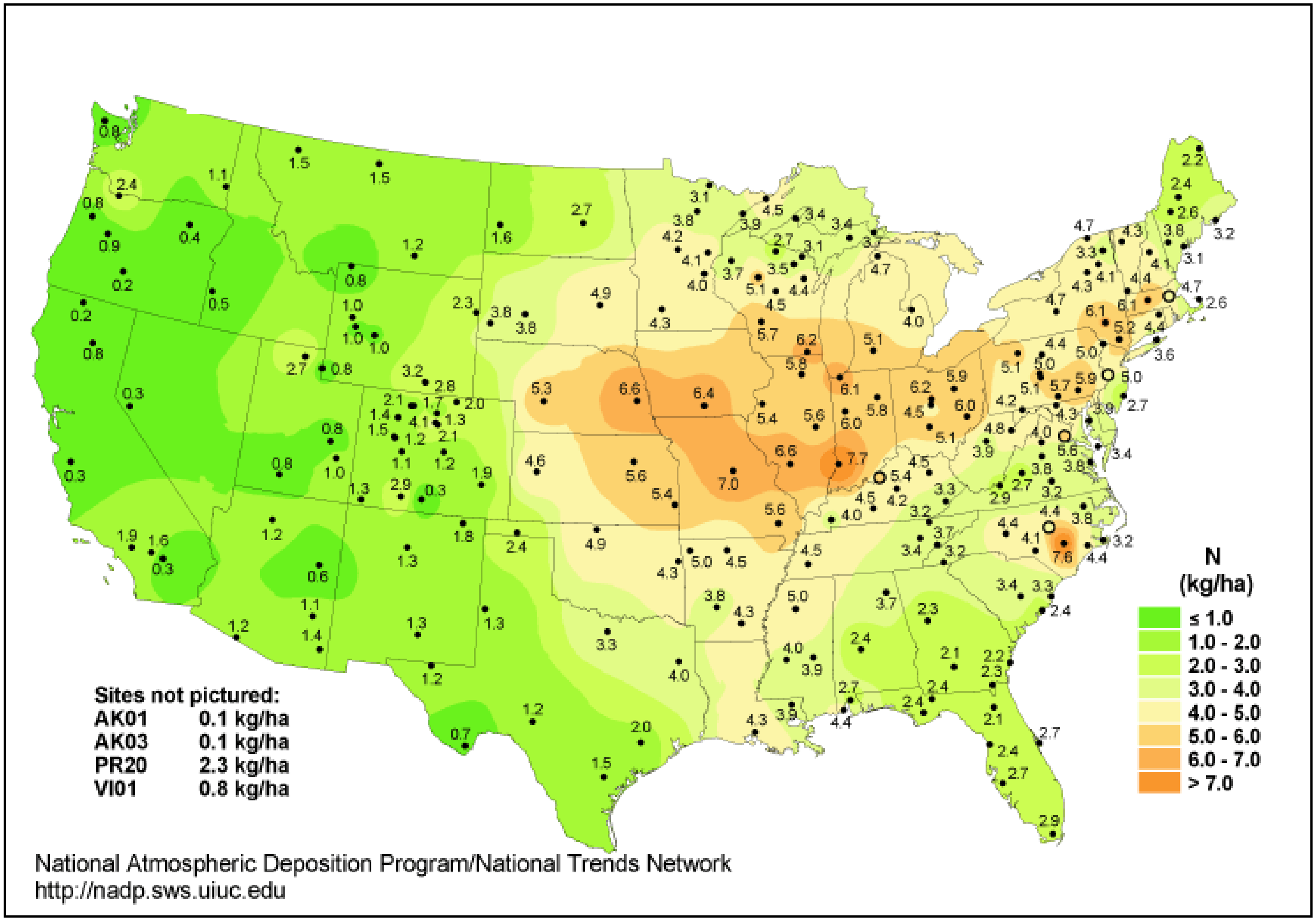
Source: USEPA 2010h

FIGURE 17.
TOTAL SULFUR DEPOSITION IN THEODORE ROOSEVELT NATIONAL PARK



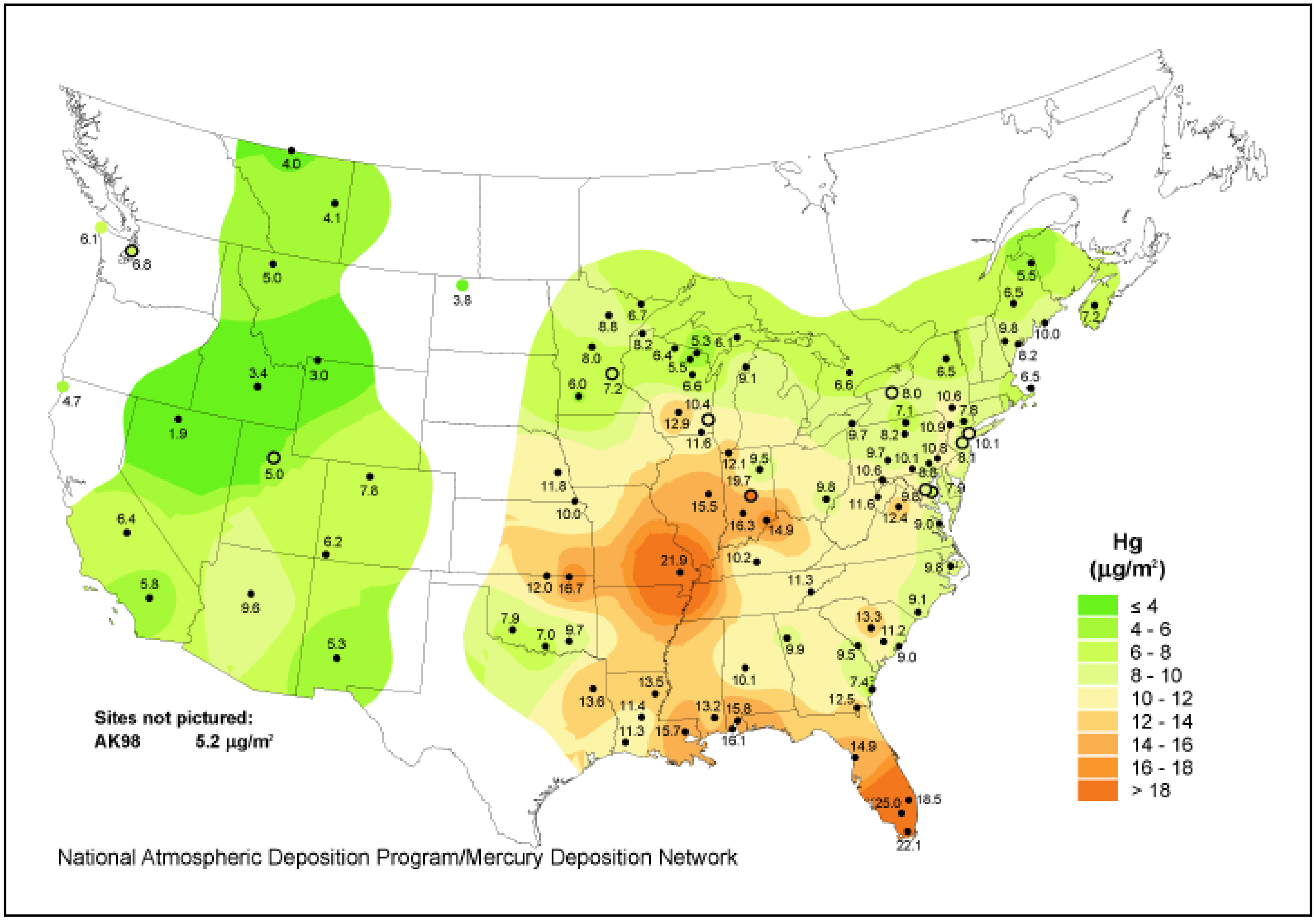
Source: USEPA 2010g

FIGURE 18.
INORGANIC NITROGEN WET DEPOSITION FROM NITRATE AND AMMONIUM IN 2008



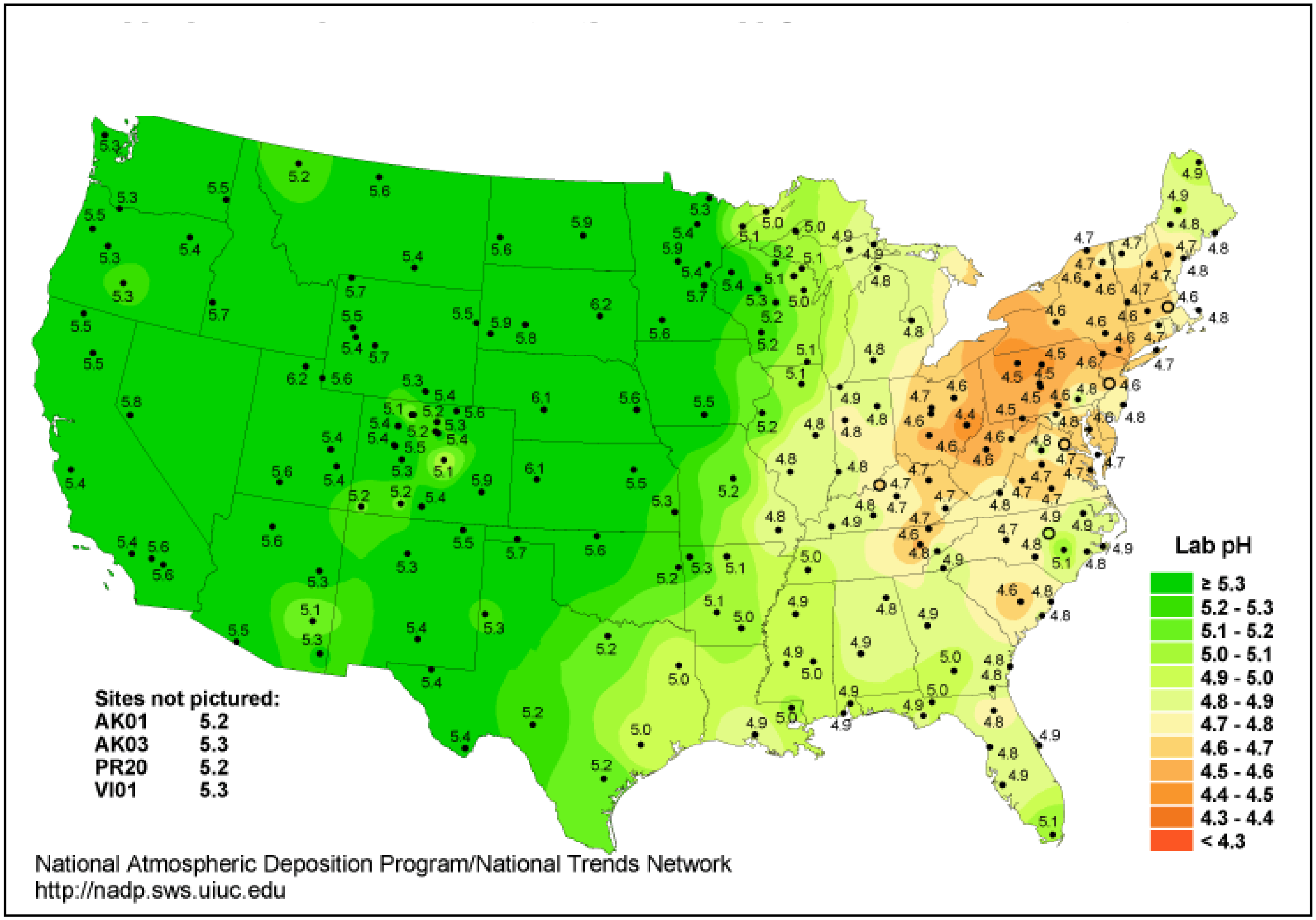
Source: NADP 2010b

FIGURE 19.
TOTAL MERCURY WET DEPOSITION IN 2008



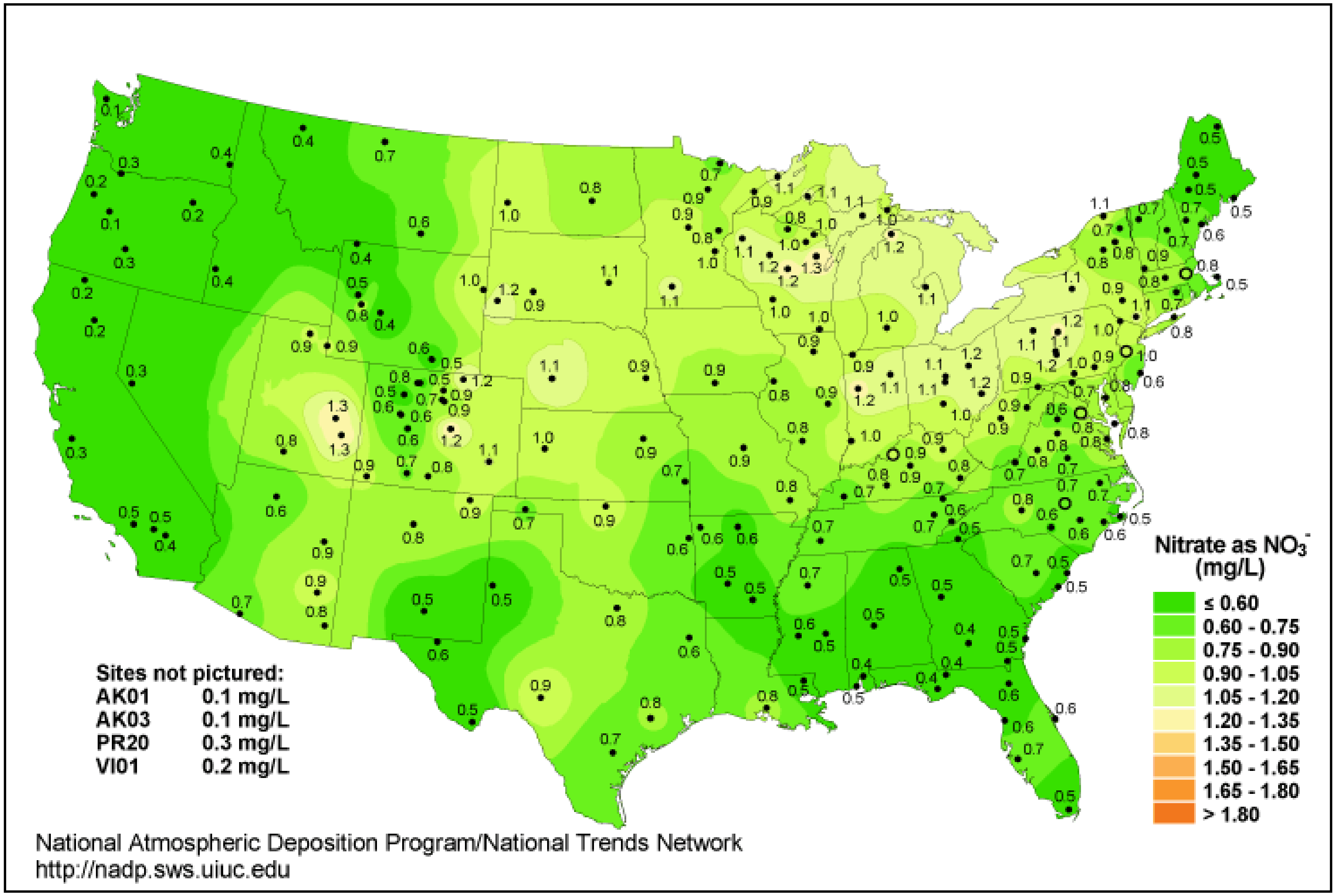
Source: NADP 2010c

FIGURE 20.
HYDROGEN ION CONCENTRATION AS PH FROM MEASUREMENTS MADE AT THE CENTRAL ANALYTICAL LABORATORY IN 2008



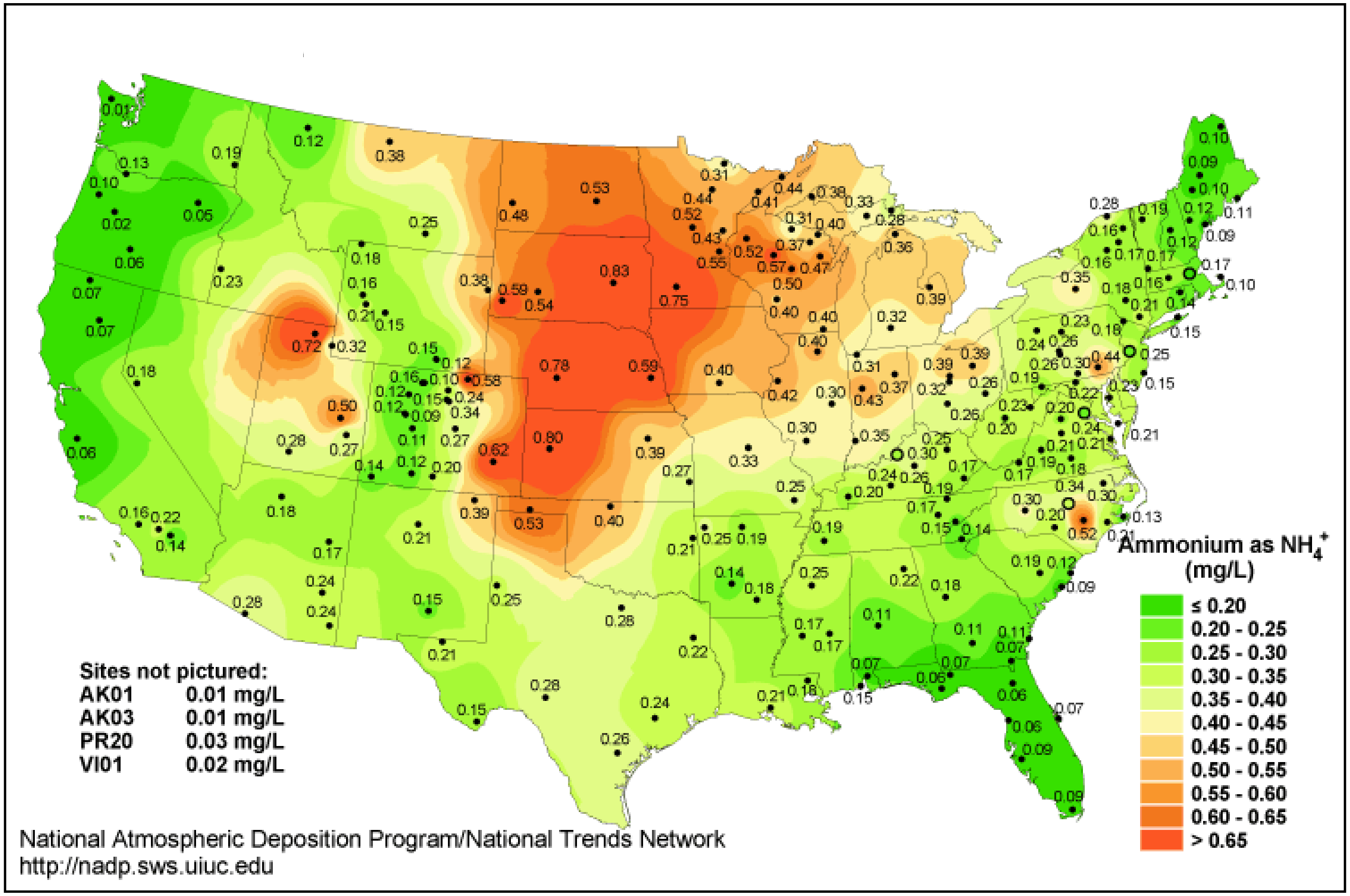
Source: NADP 2010d

FIGURE 21.
NITRATE ION CONCENTRATION IN 2008



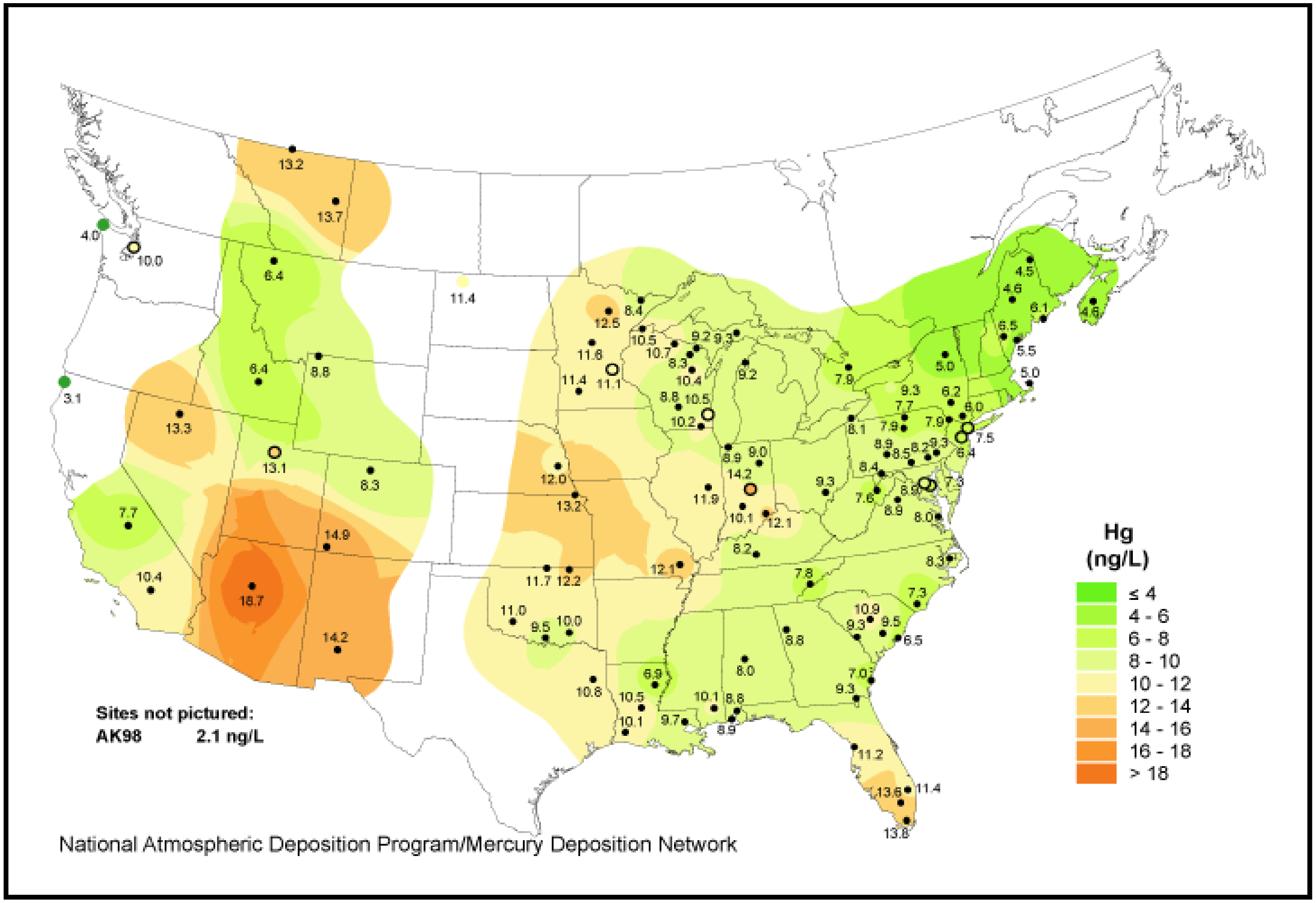
Source: NADP 2010e

FIGURE 22.
AMMONIUM ION CONCENTRATION IN 2008



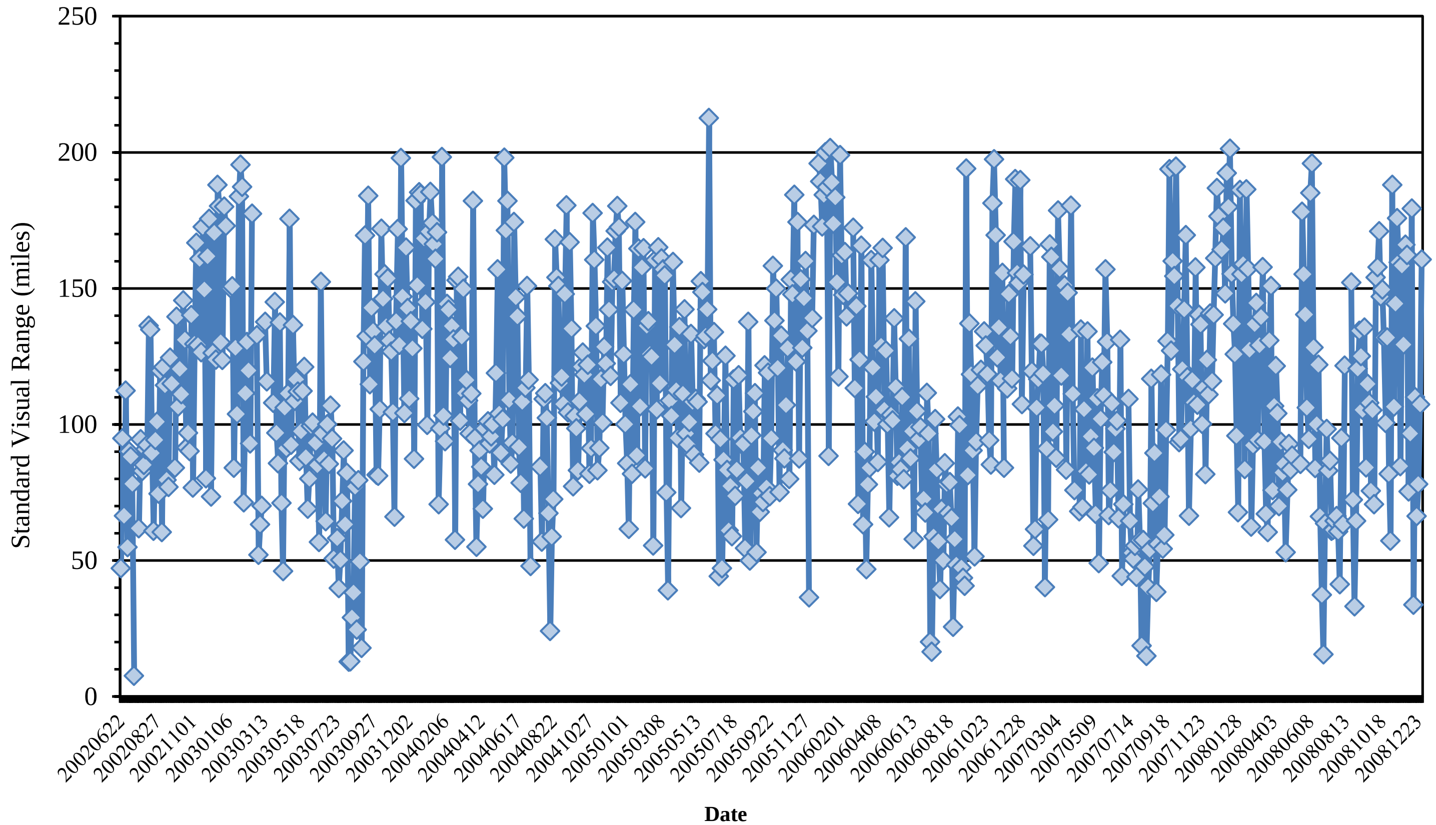
Source: NADP 2010f

FIGURE 23.
TOTAL MERCURY CONCENTRATION IN 2008



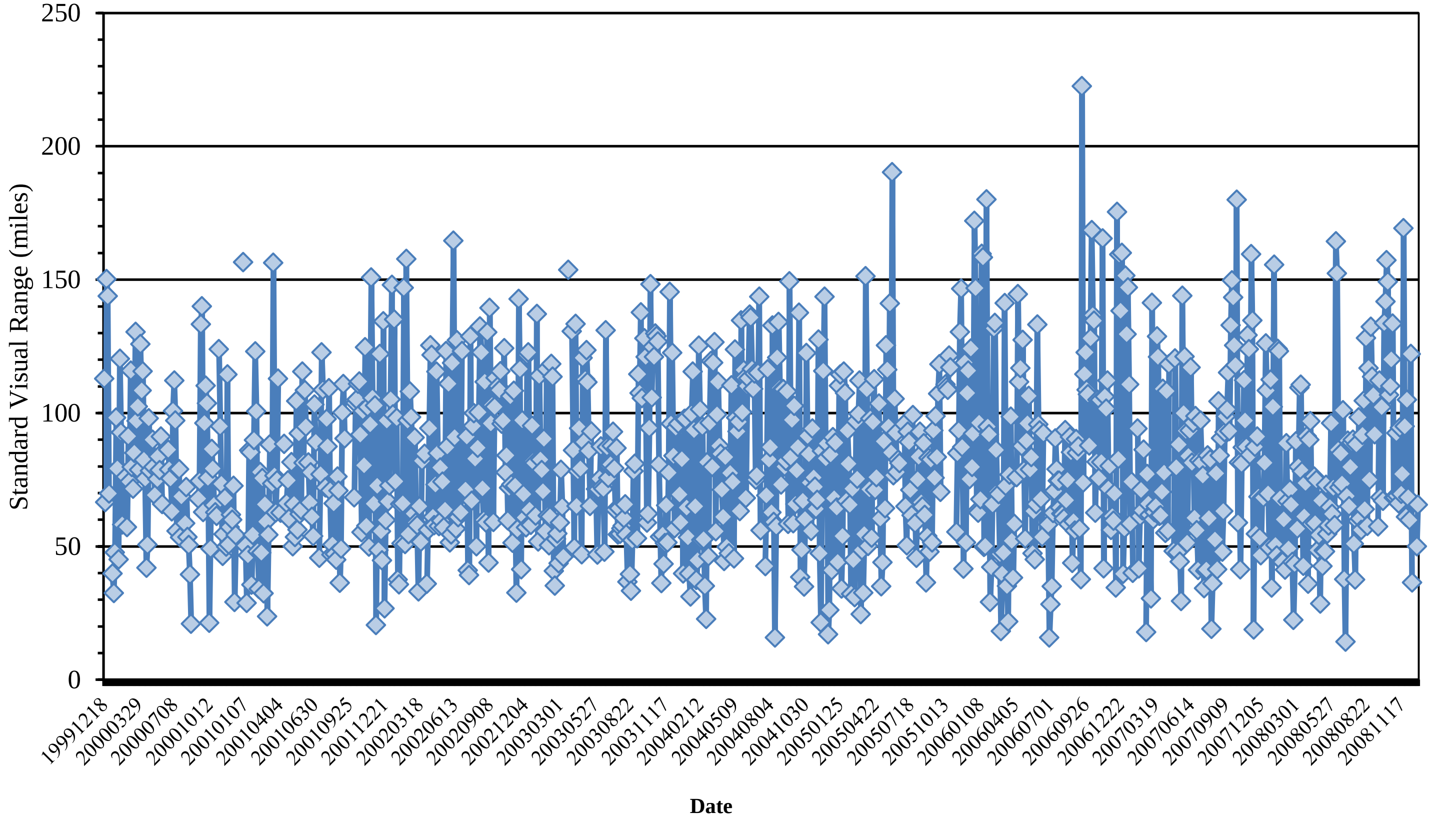
Source: NADP 2010g

FIGURE 24.
DAILY VISIBILITY REPRESENTING THE MILES CITY STUDY AREA, NORTHERN CHEYENNE INDIAN RESERVATION



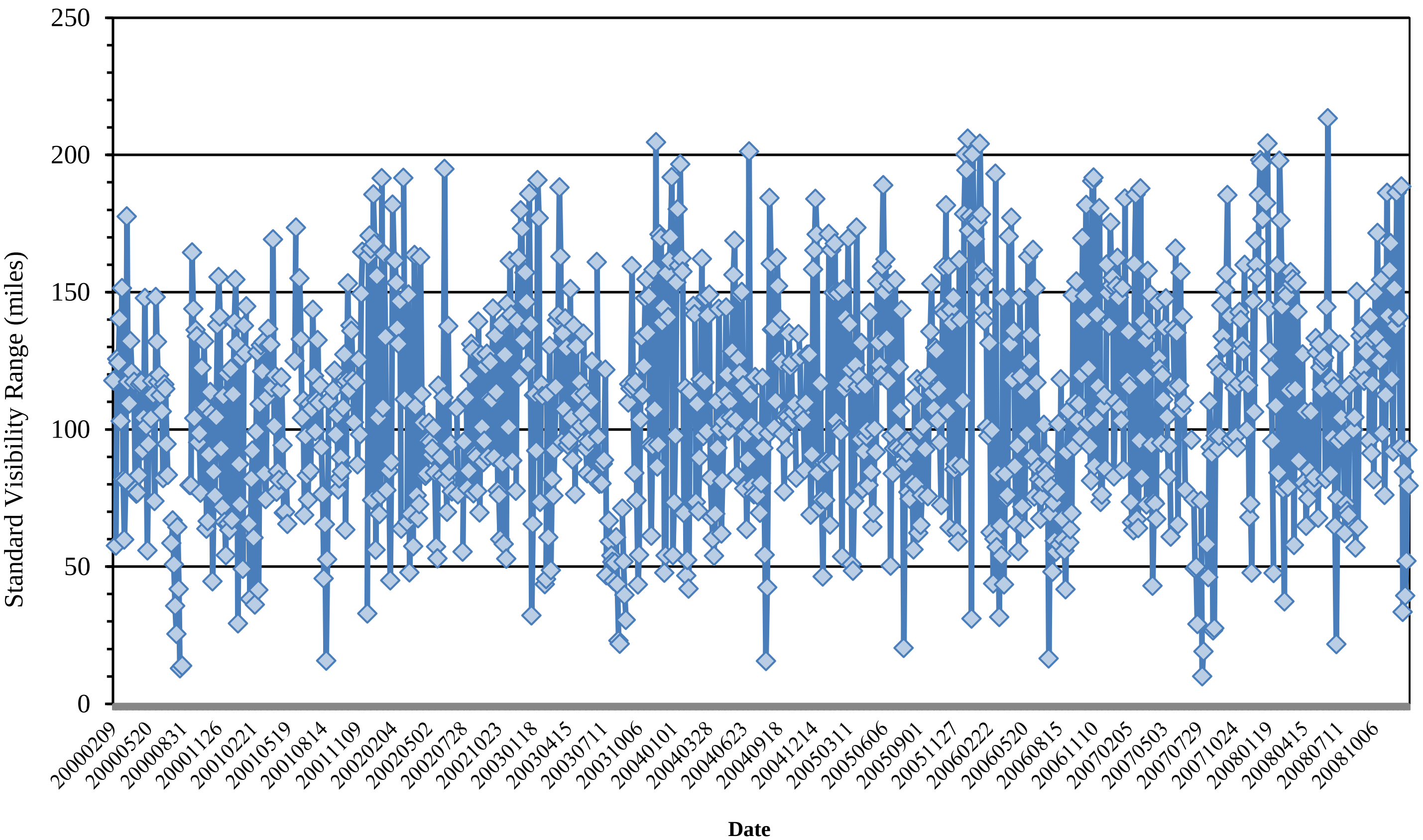
IMPROVE Northern Cheyenne Indian Reservation station: NOCH1
Visibility measured every 3 days from 6/2002 through 2008

FIGURE 25.
DAILY VISIBILITY REPRESENTING THE MILES CITY STUDY AREA, MEDICINE LAKE



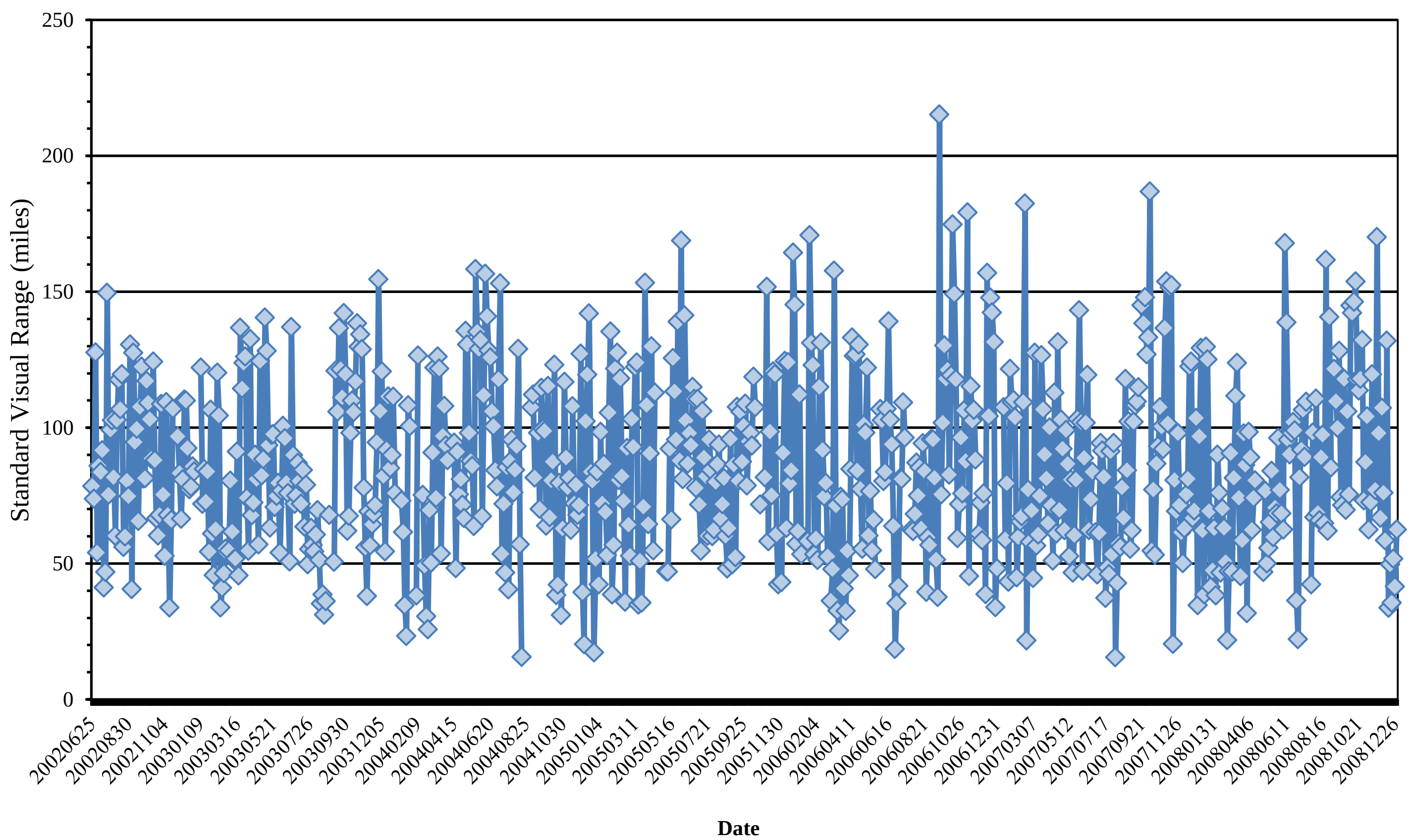
IMPROVE Medicine Lake station: MELA1
Visibility measured every 3 days from 1999 through 2008

FIGURE 26.
DAILY VISIBILITY REPRESENTING THE MILES CITY STUDY AREA, UL BEND



IMPROVE UL Bend station: ULBE1
Visibility measured every 3 days from 2000 through 2008

FIGURE 27.
DAILY VISIBILITY REPRESENTING THE MILES CITY STUDY AREA, FORT PECK INDIAN RESERVATION



IMPROVE Fort Peck station: FOPE1
Visibility measured every 3 days from 2002 through 2008

MILES CITY FIELD OFFICE AIR RESOURCE MANAGEMENT PLAN: ADAPTIVE MANAGEMENT STRATEGY FOR OIL AND GAS RESOURCES

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Table of Contents

List of Tables

Abbreviations and Acronyms

AQRV	Air Quality Related Value
AQTW	Air Quality Technical Workgroup
ARMP	Air Resource Management Plan
BLM	Bureau of Land Management
CO	Carbon Monoxide
CBNG	Coal Bed Natural Gas
CFR	Code of Federal Regulations
FLPMA	Federal Land Policy and Management Act
IWG	Interagency Working Group
MAAQS	Montana Ambient Air Quality Standards
MCFO	Miles City Field Office, Bureau of Land Management
MDEQ	Montana Department of Environmental Quality
MOU	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NPS	National Park Service
O_3	Ozone
PGM	Photochemical Grid Modeling
$PM_{2.5}$	Particulate Matter with a Diameter Less than or Equal to 2.5 Microns
PM_{10}	Particulate Matter with a Diameter Less than or Equal to 10 Microns
POD	Plan of Development
ppb	Parts per Billion
ppm	Parts per Million
PRB	Powder River Basin
RMP	Resource Management Plan
ROD	Record of Decision
SO_2	Sulfur Dioxide
µg/m3	Micrograms per Cubic Meter
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compound
WRF	Weather Research and Forecasting

1.0 INTRODUCTION

1.1 PURPOSE OF THE AIR RESOURCE MANAGEMENT PLAN

The Bureau of Land Management (BLM) *Miles City Field Office Air Resource Management Plan: Adaptive Management Strategy for Oil and Gas Resources* (ARMP) for oil and gas activities describes the air resource adaptive management strategy that would be used to assess future air quality and air quality related values (AQRVs) and identify mitigation measures to address unacceptable impacts that may be associated with future oil and gas development. The adaptive management strategy focuses on oil and gas activity because aggregated emissions from multiple small sources at well sites can potentially cause air quality and AQRV impacts under certain circumstances. The oil and gas adaptive management strategy was prepared in collaboration or with the review of the United States Environmental Protection Agency (USEPA) and three federal land management agencies under the *Memorandum of Understanding Among the U.S. Department of Agriculture, U.S. Department of the Interior, and U.S. Environmental Protection Agency, Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions Through the National Environmental Policy Act Process* (USDA, USDI, and USEPA 2011). This agreement is described in more detail in Section 4.

The ARMP includes both near-term actions and long-term actions. In the near-term, the ARMP sets forth initial actions to maintain good air quality until regional modeling can be performed to further assess potential impacts to air quality and AQRVs. In the long-term, the ARMP provides ongoing management strategies to assess and adapt to new air quality and AQRV ambient monitoring and modeling data during the life of this resource management plan (RMP).

The ARMP includes a multifaceted approach involving the following activities:

- oil and gas activity assessment,
- ambient air quality monitoring support,
- air quality and AQRV assessment,
- future air quality and AQRV modeling, and
- initial and enhanced mitigation.

Pollutant emissions addressed by the ARMP include the criteria air pollutants listed below:

- carbon monoxide (CO),
- nitrogen dioxide (NO_2),
- ozone (O_3),
- particulate matter with a diameter less than or equal to 10 microns (PM_{10}),
- particulate matter with a diameter less than or equal to 2.5 microns ($PM_{2.5}$), and
- sulfur dioxide (SO_2).

The ARMP also addresses modeling and mitigation for the following AQRVs:

- deposition of sulfur and nitrogen,
- lake acid neutralizing capacity, and
- visibility.

The adaptive management strategy for oil and gas resources provides the flexibility to respond to changing conditions that could not have been predicted during RMP development and allows for the use of new technology and methods that may minimize or reduce impacts.

1.2 REVISION OF THE AIR RESOURCE MANAGEMENT PLAN

This ARMP may be modified as necessary to comply with law, regulation, and policy and to address new information and changing circumstances. Changes to the goals or objectives set forth in the Miles City Field Office (MCFO) RMP would require maintenance or amendment of the RMP while changes to the implementation, including modifying this ARMP, may be made without maintaining or amending the RMP.

1.3 CURRENT AIR QUALITY

Based on available monitoring data for rural oil and gas nativity areas in eastern Montana, air quality is good as described in Chapter 3, *Affected Environment*. Non-tribal areas within the MCFO attain the National Ambient Air Quality Standards (NAAQS) and state-based standards, which are known as the Montana Ambient Air Quality Standards (MAAQS).

For all criteria pollutants except ozone, ambient monitoring data available as of December 31, 2012 indicate that concentrations at the Birney, Broadus, and Sidney monitors near oil and gas areas within the planning area are less than 55 percent of the NAAQS and MAAQS. Ozone concentrations are no more than 75 percent of the 8-hour ozone standard. Table ARMP-1 provides recent concentration data for each pollutant monitored at the Birney, Broadus, and Sidney monitors. NAAQS and MAAQS set forth allowable concentrations in terms of parts per million (ppm) or parts per billion (ppb) for gaseous pollutants while particulate pollutant concentrations are provided in micrograms per cubic meter ($\mu g/m^3$).

1.4 BACKGROUND OF THE AIR QUALITY TECHNICAL WORKGROUP AND THE MEMORANDUM OF UNDERSTANDING REGARDING AIR QUALITY ANALYSES AND MITIGATION FOR FEDERAL OIL AND GAS DECISIONS THROUGH THE NATIONAL ENVIRONMENTAL POLICY ACT PROCESS

The Air Quality Technical Workgroup (AQTW) is required to include representatives from the following agencies: the BLM, USEPA, United States Forest Service (USFS), United States Fish and Wildlife Service (USFWS), and the National Park Service (NPS). Each of these agencies is a party to the *Memorandum of Understanding Among the U.S. Department of Agriculture, U.S. Department of the Interior, and U.S. Environmental Protection Agency, Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions Through the National Environmental Policy Act Process* (USDA et al. 2011) (referred to as the MOU). This agreement is designed to "... facilitate the completion of NEPA [National Environmental Policy Act] environmental analyses for Federal land use planning and oil and gas development decisions"(USDA et al. 2011, p. 1). Additional entities, such as the Montana Department of Environmental Quality (MDEQ) and tribal entities, may also participate in the AQTW.

This MOU sets forth collaborative procedures that the AQTW agencies use to analyze potential air quality and AQRV impacts. The agencies also work together to identify potential mitigation measures that may be needed to reduce impacts to air quality and AQRVs. The lead agency (the BLM in this case), in collaboration with the other agencies, has the responsibility to identify reasonable mitigation and control measures and design features to address adverse impacts to air quality. Mitigation measures may also address impacts to AQRVs at Class I areas and at sensitive Class II areas that have been identified by the BLM, USFS, USFWS, and NPS.

The AQTW provided input to this ARMP and will continue to work collaboratively on future modeling efforts associated with this RMP. Provisions of the MOU continue to apply to future oil and gas activities in the planning area. In some cases, air quality and AQRV modeling performed under this ARMP may be sufficient to address modeling needs for future oil and gas projects that would otherwise require additional modeling under the MOU. However, the ARMP in no way replaces provisions of the MOU. Determinations of existing modeling adequacy for future oil and gas activities that trigger the MOU would be made collaboratively by the AQTW using the procedures included in the MOU.

The MDEQ has the primary authority to protect air quality within the state. Although the MDEQ is not a signatory to the national MOU, successful air quality management of BLM-authorized oil and gas activities depends on a close working relationship between the BLM and the MDEQ. The two agencies have worked together to improve air quality monitoring and will continue to cooperate by sharing data, planning modeling efforts, and working together to identify emission reduction measures needed to maintain good air quality.

TABLE ARMP-1.
AMBIENT CONCENTRATION DATA FOR POLLUTANTS MONITORED IN THE PLANNING AREA

Pollu-tant	Avg. Period	Metric	Form	NAAQS	NAAQS Units	Monitored Concentrations During Monitored Years (Birney, Broadus, Sidney)[1]	Percentage of Standard (Birney, Broadus, Sidney) (%)
NO_2	1-hour	98^{th} Percentile	3-year average	100	ppb	8, 16, 9	8%, 16%, 9%
O_3	8-hour	4^{th} maximum	3-year average	0.075	ppm	0.056, 0.055, 0.056	75%, 73%, 75%
$PM_{2.5}$	24-hour	98^{th} Percentile	3-year average	35	$\mu g/m^3$	12, 16, 43	34%, 46%, 43%
	Annual	Mean	3-year average	12.0 [2]	$\mu g/m^3$	4.9, 6.2, 6.6	41%, 52%, 55%
PM_{10}	24-hour	Not to be exceeded more than once per year	3-year average	150	$\mu g/m^3$	Not exceeded, not exceeded, not exceeded	13%, 21%, 16% [3]
SO_2	1-hour	99^{th} Percentile	3-year average	75	ppb	NA/NA/5	NA/NA/7%

Source: MDEQ 2013.
NA = not available
[1]Based on calendar year 2010 to 2012 data.
[2]The annual $PM_{2.5}$ primary NAAQS was revised from 15.0 $\mu g/m^3$ to 12.0 $\mu g/m^3$, effective on March 18, 2013.
[3]Estimated by comparing the second maximum value to the NAAQS.

1.5 MDEQ AIR QUALITY MANAGEMENT AND BLM MITIGATION MEASURES

Primary air quality management authority and responsibility for the planning area rest with the MDEQ (for non-tribal areas of the planning area) and the USEPA for tribal areas. However, the BLM also plays a role in protecting air resources under the Federal Land Policy and Management Act (FLPMA) and NEPA. Due to the nature of NEPA analyses for land use planning, the BLM's air resource management role is forward-looking because air resource impacts are analyzed for future activities that may or may not occur.

1.5.1 MDEQ Air Quality Programs

The MDEQ has been delegated Federal Clean Air Act authority from USEPA to regulate air quality and air emissions requirements within the non-tribal areas of Montana. The MDEQ also implements state ambient air quality standards for additional air pollutants and has established more stringent standards for some criteria air pollutants, as shown in Table ARMP-3. As part of NAAQS implementation, the MDEQ operates air quality monitors through Montana.

The MDEQ has State Implementation Plan approved New Source Review permitting programs, which include Prevention of Significant Deterioration, Nonattainment Area, and minor source programs. The MDEQ's Prevention of Significant Deterioration and Nonattainment Area permitting programs impose controls on major stationary sources in order to control emissions of regulated pollutants. Emission controls are typically required through the application of Best Available Control Technology or Lowest Achievable Emission Rate, depending on the applicable New Source Review permitting program. In addition, the MDEQ implements a minor source New Source Review permitting program (e.g. minor source Montana Air Quality Permits and registrations). The MDEQ's minor source New Source Review program requires sources with a potential to emit greater than 25 tons per year of any regulated air pollutant to apply for a permit to construct pursuant to the Montana Air Quality Permits requirements or register with the MDEQ pursuant to the registration requirements under the Administrative Rules of Montana. To ensure compliance with the NAAQS, MDEQ's minor New Source Review program contains regulatory requirements that track activity and require the application of Best Available Control Technology. Additionally, the Administrative Rules of Montana require reasonable precautions to limit fugitive particulate emissions from all activities in Montana (i.e., permitted, registered, and those facilities that do not require a permit/registration). MDEQ's New Source Review program not only provides the emission benefits necessary to attain Montana's air quality goals, but also includes many features that provide regulatory certainty while still allowing flexibility in the implementation of Montana's air quality programs.

1.5.2 MDEQ Oil and Gas Emission Control Requirements

The MDEQ minor source permitting and registration program for oil and gas facilities includes a robust set of emission controls. MDEQ rules require oil or gas well facilities to control emissions from the time the well is completed until the source is registered or permitted. Facilities that choose to register must meet the emission control requirements contained in Administrative Rules of Montana 17.8.17. If a source cannot meet these requirements it must apply for an Montana Air Quality Permits. The Montana Air Quality Permits requires a case-by-case Best Available Control Technology analysis. A case-by-case Best Available Control Technology analysis may include design, equipment, work practice, or operational standards in place of or in combination with an emission limitation.

Examples of MDEQ emission control requirements for oil and gas facilities (defined as those with a potential to emit more than 25 tons per year of any airborne pollutant) include the following measures to limit emissions.

- Each piece of oil or gas well facility equipment containing volatile organic compound (VOC) vapors (as defined in the permitting or registration regulations) with a potential to emit 15 tons per year or more must be routed to a gas pipeline or to air pollution control equipment with 95 percent or greater control efficiency (registered facilities). This requirement applies to the following equipment.
    - Oil and gas wellhead production equipment including, but not limited to, wellhead assemblies, amine units, prime mover engines, phase separators, heater treatment units, dehydrator units, storage tanks, and connector tubing
    - Transport vehicle loading operations
- Hydrocarbon liquids must be loaded into transport vehicles using submerged fill technology.
- Stationary internal combustion engines greater than 85 brake horsepower must be equipped with nonselective catalytic reduction (for rich burn engines) or oxidation catalytic reduction (for lean burn engines) or equivalent emission reduction technologies.
- Piping components containing VOCs must be inspected for leaks each month. The first attempt to repair any leaking VOC equipment must occur within 5 days and the repair must be completed no later than 15 days after the leak is initially detected unless facility shutdown is required. Facilities are required to maintain monthly leak inspection and repair records.

Although MDEQ emission control requirements do not mention Greenhouse Gas, the VOC emission control measures would also reduce methane emissions, while the engine emission controls would reduce nitrous oxide emissions.

The MDEQ oil and gas emission control requirements have successfully protected air quality throughout the planning area, as evidenced by ambient air quality monitoring data that indicate good air quality in oil and gas activity areas.

1.5.3 BLM Air Resource Management and MDEQ Coordination

The BLM's authority to address air resources derives primarily from FLPMA and NEPA. Under FLPMA, the BLM must "provide for compliance with applicable pollution control laws, including State and Federal air, water, noise, or other pollution standards or implementation plans" in the development and revision of land use plans (Section 202 (c)(8)). FLPMA also authorizes the BLM to manage public lands "in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values" (Section 102 (8)).

Under NEPA, the BLM ensures that information on the potential environmental and human impact of Federal actions is available to public officials and citizens before decisions are made and before actions are taken. One of the purposes of the Act is to "promote efforts which will prevent or eliminate damage to the environment and biosphere," and to promote human health and welfare (Section 2). NEPA requires that BLM and other federal agencies prepare a detailed statement on the environmental impact of the proposed action for major Federal actions expected to significantly affect the quality of the human environment (Section 102 (C)).

The BLM's authority under the Clean Air Act primarily derives from the requirement that BLM-authorized activities comply with the Clean Air Act. BLM-authorized activities may not violate the Clean Air Act or federal and state regulations and State Implementation Plans issued to implement the Act. When air quality or AQRV modeling performed during NEPA analysis predicts potential violations of the Clean Air Act or unacceptable AQRV impacts, the BLM evaluates the data and determines whether mitigation measures are needed. For example, the initial mitigation measure requiring drill rig engines to meet Tier 4 emission standards reduces NO_2 emissions and was demonstrated via modeling to prevent NAAQS violations from multiple large drill rig engines that may operate on one well pad. The mitigation measure includes an exception that allows use of drill rig engines meeting Tier 1, 2, or 3 emission standards if future modeling or near-field monitoring demonstrates compliance with the NAAQS.

When determining whether mitigation measures are needed, the BLM reviews current and proposed federal, state, and local regulations to determine whether mitigation will occur due to other agency actions. If the BLM determines that additional mitigation is needed while implementing this ARMP, the BLM will work closely with the MDEQ to coordinate future mitigation measures for BLM-authorized activities.

1.6 RELATIONSHIP TO THE MONTANA RECORD OF DECISION FOR THE SUPPLEMENT TO THE MONTANA STATEWIDE OIL AND GAS ENVIRONMENTAL IMPACT STATEMENT AND AMENDMENT OF THE POWDER RIVER AND BILLINGS RESOURCE MANAGEMENT PLANS ARMP

This ARMP integrates and supplements earlier ARMP provisions within the *Record of Decision for the Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans* (BLM 2008b). Provisions of this document's ARMP are currently in effect and were developed to address substantial predicted growth in coal bed natural gas (CBNG) drilling and production in the Powder River Basin (PRB). Based on extensive air quality and AQRV far-field modeling, predicted impacts described in the *Supplemental Air Quality Analysis to the Draft Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans* (BLM 2007; BLM 2008a) were associated primarily with projected emission increases from the operation of additional compressor engines. Consequently, increases in total compression horsepower were determined to be an indicator of growth in oil and gas activity that could potentially degrade air quality and AQRVs.

ARMP provisions included in the BLM's 2008 *Record of Decision for the Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans* are summarized below.

Emission Mitigation

- Fugitive dust controls are required to reduce particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$) emissions from unpaved roads.
- The number of wells connected to each compressor must be maximized and natural-gas-fired or electrical compressors or generators are required.
- Operators within 5 miles of the Northern Cheyenne Indian Reservation and the Crow Indian Reservation may be required to restrict the timing or location of CBNG development if monitoring or modeling by the MDEQ finds that their CBNG development is causing or threatening to cause noncompliance with applicable local, state, tribal, and federal air quality laws, regulations, and standards, as well as state implementation plans developed by the MDEQ.

Activity and Emission Monitoring

- Compression horsepower associated with CBNG is required to be reviewed.
- Annual emission inventory reports for CBNG operations are required to be submitted by operators.

Ambient Air Quality Monitoring

- The BLM will develop monitoring plans to track regional cumulative impacts to air quality and establish programmatic mitigation at predetermined action levels.
- Ambient concentration data from the Birney and Broadus sites will be used to meet ambient monitoring requirements included in Table MON-1 in the *Monitoring Appendix* of the BLM's 2008 *Record of Decision for the Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans*.

Air Quality Impact Review

- Oil and gas operators are required to provide information necessary for the BLM to conduct an analysis of air quality impacts when submitting exploration applications for permits to drill or field development project plans for CBNG development. The BLM uses the information to determine the individual and cumulative impacts on Tribal air quality, disclose the analysis results in the appropriate NEPA document, and consult with the Tribe when the analysis shows impacts from a specific drilling or development proposal.
- An interagency working group (IWG) was formed consisting of the BLM, USEPA, NPS, and USFS and other federal, state agencies, and tribal authorities to address CBNG development in the Montana portion of the PRB and its impacts to air quality. In addition to other resource responsibilities, the IWG is responsible for developing and recommending the monitoring and mitigation measures needed for each agency to ensure its actions achieve compliance with applicable air quality standards across jurisdictional boundaries.

Air Quality and Visibility Modeling

- The MDEQ agreed to complete an annual cumulative air quality impact model to track air quality impacts of CBNG development, including relevant CBNG development in Wyoming.
- The BLM and the MDEQ will perform additional visibility modeling to assess visibility impacts when horsepower requirements for new CBNG wells in the Montana portion of the PRB exceed 133,956 horsepower.

The above requirements are being integrated into this ARMP. Some provisions are being updated to reflect the current state of knowledge while other provisions are being expanded to provide for a more comprehensive adaptive management strategy. Modeling provisions within the ARMP included in the BLM's 2008 *Final Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the*

Powder River and Billings Resource Management Plans are being revised to reflect an improved modeling approach (described in Section 5.1 of visibility and criteria pollutants, including ozone. CBNG development in the Montana portion of the PRB did not materialize as predicted at the time of the BLM's *Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans*. According to the MDEQ, CBNG compression within the PRB has decreased by 1,676 horsepower since January 1, 2010 (MDEQ 2011). Because of the lack of CBNG development and the lack of new compression equipment to model, the MDEQ determined that additional ambient air quality monitoring would be the best air quality indicator. With funding provided by the BLM, two new monitoring stations were installed in the PRB near Birney (Rosebud County) and Broadus (Powder River County) in 2009. Due to the low level of oil and gas activity in the area, the following two emission reduction provisions from the Supplemental Environmental Impact Statement are not carried forward by this ARMP: (1) maximize the number of wells connected to each compressor, and (2) utilize natural gas or electrical compressors or generators. The need for these measures will be assessed during review of photochemical grid modeling (PGM) results from modeling performed as part of this ARMP. The PGM will use emission inventories reflecting more recent oil and gas activity data.

The remainder of this ARMP describes each of the provisions being carried forward from the ARMP included in the BLM's 2008 *Final Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans*.

2.0 OIL AND GAS ACTIVITY ASSESSMENT

Each year, the BLM would track the number and locations of new oil and gas wells drilled on federal mineral estate and the number of new and abandoned producing wells on federal mineral estate. These numbers would be compared to the planning area reasonably foreseeable development and to the level of oil and gas development identified in the Miles City Field Office Proposed Resource Management Plan and Final Environmental Impact Statement.

In addition, the BLM would estimate oil and gas emissions from federal mineral estate every 3 years for oil and gas wells drilled and producing after the record of decision (ROD) is signed. Emission estimates would be based on well types, well numbers, and knowledge of typical equipment and operations. Methods used to estimate emissions are expected to improve over time as better data become available. The emission estimates will also account for implemented mitigation measures and for new emission control regulations as they become effective. Each 3-year oil and gas emission inventory would be compared to emission estimates for the reasonably foreseeable development for the Miles City Field Office Proposed Resource Management Plan and Final Environmental Impact Statement. BLM would collect additional data related to oil and gas equipment and operations to improve emission inventory quality. One area identified for improvement involves acquiring better data on oil and gas equipment used in the planning area. In order to improve fugitive dust emission estimates, the number, type, and length of vehicle trips in high-activity areas would be assessed.

For the portion of the PRB located in the MCFO, increases in compressor horsepower will be tracked annually using data provided by the MDEQ.

3.0 AMBIENT AIR QUALITY MONITORING SUPPORT

The Air Resources Management Bureau of the MDEQ has primary responsibility for siting and operating ambient air quality monitors within Montana and for reporting monitoring data to the USEPA and to the public. As described in its annual *State of Montana Air Quality Monitoring Network Plan* (MDEQ 2013), the MDEQ identifies monitoring objectives for assessing ambient concentrations of criteria air pollutants and assessing compliance with the NAAQS and MAAQS. Historically, most MDEQ monitors were placed in cities to assess human health impacts in the more densely populated areas of Montana.

The BLM is working collaboratively with the MDEQ to place ambient air quality monitors in less densely populated areas in which oil and gas activities are occurring or may occur in the future. The purpose of these monitors is:

- to assess compliance with ambient air quality standards, and
- to provide background ambient air quality concentrations for use in modeling efforts.

Using cooperative agreements, the BLM has provided funding to help purchase, install, and operate monitoring equipment at the locations shown in Table ARMP-2.

Each of the monitors described above measures ambient concentrations of nitrogen dioxide, nitric oxide, nitrogen oxides, ozone, particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$), as well as meteorological parameters such as temperature, wind speed, and wind direction. In addition, the Sidney monitoring station began monitoring sulfur dioxide during 2011.

TABLE ARMP-2.
MILES CITY FIELD OFFICE MONITORING STATIONS

Station Name	Monitored Pollutants	Year Installed	Station Number	County	Latitude	Longitude
Birney	NO, NO_2, NO_x, O_3, PM_{10}, $PM_{2.5}$	2010	30-87-0001	Rosebud	45.3662	-106.4894
Broadus	NO, NO_2, NO_x, O_3, PM_{10}, $PM_{2.5}$	2010	30-75-0001	Powder River	45.4403	-105.3702
Sidney	NO, NO_2, NO_x, O_3, PM_{10}, $PM_{2.5}$, SO_2[1]	2008	30-83-001	Richland	47.8034	-104.4856

[1]SO_2 monitoring began in June 2011.

In its 2013 *State of Montana Air Quality Monitoring Network Plan*, the MDEQ proposed to change the status of particulate matter (PM_{10}) monitors at the Birney, Broadus, and Sidney monitoring sites (MDEQ 2012). Particulate matter (PM_{10}) monitors at the Birney and Broadus sites are currently designated as State or Local Air Monitoring Station monitors, which are used to determine compliance with the NAAQS and MAAQS. However, the MDEQ has proposed to the USEPA that the Birney and Broadus particulate matter (PM_{10}) monitors be redesignated to non-regulatory special purpose monitors because the monitors are located within 60 meters of unpaved gravel roads used for ranching access. High episodic particulate matter (PM_{10}) levels have been measured at the Birney and Broadus sites. The MDEQ characterizes the high episodic monitored concentrations as "... not indicative or representative of general PM_{10} concentrations in the desired monitored area" (MDEQ 2012, p. 14).

Existing monitors at the Sidney monitoring station are currently designated as "industrial-non-regulatory" monitors. In response to a request from the USEPA, the MDEQ intends to redesignate each of the Sidney monitors to State or Local Air Monitoring Station monitors, except for the particulate matter (PM_{10}) monitor. Because of concerns regarding episodic particulate matter (PM_{10}) concentrations associated with travel on unpaved gravel roads, the MDEQ does not plan to change the status of the Sidney particulate matter (PM_{10}) monitor (MDEQ 2012).

Although the particulate matter (PM_{10}) monitors proposed for redesignation indicate high particulate matter (PM_{10}) concentrations, data through 2011 indicate that particulate matter (PM_{10}) concentrations are well below the NAAQS and MAAQS at the Birney and Sidney monitors (Table ARMP-1). In contrast, 24-hour particulate matter (PM_{10}) concentrations at the Broadus monitor (based on only 1 year of data) are approaching the NAAQS.

4.0 AIR QUALITY AND AQRV ASSESSMENT

The BLM would assess air quality and AQRVs on an annual basis using quality-assured data from the USEPA, MDEQ, USFS, USFWS, NPS, and other sources. In addition, preliminary assessments of ozone concentrations would be performed on a weekly basis using data provided by the MDEQ.

4.1 ANNUAL NATIONAL AMBIENT AIR QUALITY STANDARDS AND MONTANA AMBIENT AIR QUALITY STANDARDS ASSESSMENT

Based on the monitors listed in Section 3.0, the BLM would assess air quality monitoring data annually and share the results of the assessment with the MDEQ and AQTW. The purposes of the annual assessment are to compare monitored data to NAAQS and MAAQS and to identify seasonal and long-term trends in air pollutant concentrations. The BLM would complete the annual assessment will be performed by May 31 of each year in order to ensure that quality-assured data are available for review. Monitoring data associated with exceptional events, typically due to wildfires, would be excluded from the assessment.

NAAQS and MAAQS are provided in Table ARMP-3 for pollutants monitored within the planning area. Montana standards are shown only if they are more stringent than the NAAQS. As of November 1, 2012, lead and carbon monoxide are criteria pollutants that are not monitored within the planning area. With regard to pollutants regulated exclusively under the MAAQS, hydrogen sulfide and settleable particulate matter are not monitored within the planning area. Hydrogen sulfide is not monitored because ambient concentrations are believed to be very low due to low sulfur levels in gas produced in the area. Settleable particulate matter is not monitored in the area because the MDEQ prioritizes monitoring of pollutants subject to NAAQS and settleable particulate matter is a state ambient air quality standard.

The BLM would use design values to compare ambient monitoring data to the NAAQS. Design values reflect the form of the NAAQS and MAAQS; they define the statistical metric used to compare monitoring data to federal and state standards. Depending on the pollutant and averaging time being assessed, a NAAQS is typically stated in terms of the maximum or second maximum concentration, average concentration, or a percentile of the standard. The form of a standard also states whether the design value is determined based on 1 or more years of monitoring data. USEPA-calculated design values serve a critically important regulatory purpose of determining whether areas are designated attainment or nonattainment. As such, the USEPA's design value determinations may take more than a year to finalize.

In order to review air quality trends more quickly, the BLM would determine "mitigation design values" by May 31 of each year for the previous calendar year or years. The mitigation design value would be a metric calculated by the MDEQ or BLM that uses procedures similar to the USEPA's regulatory design value calculation methodology, with the advantage that the MDEQ/BLM-calculated mitigation design values can be determined more quickly. The timing allows the MDEQ adequate time to quality assure monitoring data. However, the MDEQ may not yet have USEPA concurrence on data that has been flagged by the MDEQ resulting from exceptional events, such as wildfires. Consequently, the MDEQ/BLM-calculated mitigation design values would exclude monitoring data associated with MDEQ-identified exceptional events. Each BLM annual assessment would look back the requisite number of years for each pollutant and include data from the time period prior to ROD issuance for the first several annual BLM assessments. Additional information concerning design value calculations is provided in Section 6.2.3. The BLM will work closely with the MDEQ to ensure that only data certified by the MDEQ and procedures consistent with MDEQ procedures are used in design value calculations.

Results of the annual NAAQS assessment would be used to determine if additional mitigation measures were needed to reduce air quality impacts from oil and gas operations, as discussed in Section 6.2.2 or 6.2.4.

4.2 PRELIMINARY OZONE ASSESSMENT

The BLM would perform weekly preliminary ozone concentration reviews to determine if high ozone events occur at the monitors listed in Section 3.0. If a high-ozone event occurred, the BLM would document meteorological and other conditions that may have contributed to the event. Because high-ozone events in other rural parts of the nation are not well understood and contributing factors can be site-specific, the BLM would gather data to develop baseline information relevant to any high-ozone events that may occur within the planning area. Relevant baseline information includes capturing meteorological data for each event, determining the amount of snow on the ground (if applicable), and identifying any other data that may help describe circumstances associated with the event. For the purposes of this effort, a high-ozone event would be defined as a day for which the maximum 8-hour average ozone concentration is at or above 0.065 ppm.

In order to quickly ascertain relevant circumstances, the preliminary ozone assessments would use non-quality-assured data provided by the MDEQ. As part of the annual NAAQS assessment, quality-assured ozone data would be reviewed to determine if the preliminary ozone monitoring data were valid or if monitored high ozone concentrations were due to monitor malfunctions or exceptional natural events.

If high-ozone events occur within the planning area, a summary of events and a discussion of relevant meteorological data and circumstances would be developed as part of the annual NAAQS assessment. These summaries and the underlying data will create baseline information describing ozone behavior in the planning area. The data may provide important information that can be used to identify mitigation measures that could prevent future events.

TABLE ARMP-3.
AMBIENT AIR QUALITY STANDARDS FOR
POLLUTANTS MONITORED IN THE PLANNING AREA

Pollutant	Averaging Period	Federal NAAQS[1]			MAAQS[2]
		Concentration	Standard Type	Form of NAAQS Primary Standard	Concentration
NO_2	1-hour	100 ppb	Primary	3-year average of the 98th percentile concentrations	0.30 ppm
	Annual	53 ppb	Primary, Secondary	Annual mean	0.05 ppm[7]
Ozone	1-hour	0.10 ppm	---	---	0.12 ppm[8]
	8-hour	0.075 ppm	Primary, Secondary	3-year average of the fourth daily maximum 8-hour average	---
$PM_{2.5}$	24-hour	35 μg/m[3]	Primary, Secondary[3]	3-year average of the maximum	---
	Annual	12.0 μg/m[3]	Primary[8]	Annual mean	---
	Annual	15.0 μg/m[3]	Secondary[8]	Annual mean	---
PM_{10}	24-hour	150 μg/m[3]	Primary, Secondary	Not to be exceeded more than one per year on average over 3 years	---
	Annual	Revoked[4]	---	---	50 μg/m[3, 6]
SO_2	1-hour	75 ppb	Primary	3-year average of the 99th percentile concentrations	0.50 ppm
SO_2	3-hour	0.5 ppm	Secondary	Annual 2nd maximum	---
	24-hour	0.14 ppm[5]	Primary	Annual 2nd maximum	0.10 ppm
	Annual	0.030[5]	Primary	Annual mean	0.02 ppm[7]

[1]NAAQS are codified in Title 40 of the Code of Federal Regulations (CFR), Part 50.
[2]Montana AAQS are codified in Title 17, Chapter 8, Subchapter 2 of the Ambient Air Quality in the Administrative Rules of Montana.
[3]USEPA proposed a new secondary standard for $PM_{2.5}$ visibility of 28 or 30 deciviews (equivalent to 24 or 19 kilometers [15 or 12 miles] standard visual range).
[4]The annual PM_{10} NAAQS was revoked October 17, 2006.
[5]The existing annual and 24-hour SO_2 NAAQS will be revoked 1 year after the effective date in areas with a designated attainment status for the revised SO_2 NAAQS, per 40 CFR §50.4(e).
[6]Based on annual second maximum.
[7]Not to be exceeded in the averaging period specified.
[8]State violation when exceeded more than once during any 12 consecutive months.

4.3 ASSESSMENT

Federal land managers track the status, condition, and trends of AQRVs for Class I and sensitive Class II areas under their jurisdictions. Consequently, the BLM would request visibility, sulfur, and nitrogen deposition, and lake acid neutralizing capacity data from the USFS, USFWS, and NPS and would include agency-submitted data in the BLM's annual review of AQRV trends. The annual review would also include AQRV data from any Class I or data for sensitive Class II areas BLM jurisdiction.

Based on these reviews, the BLM would maintain an awareness of AQRV trends. However, it should be noted that the reviews would not necessarily link AQRV trends to oil and gas development. AQRV impacts are often associated with pollutants that can be transported long distances from many different types of sources. For example, visibility degradation in eastern Montana primarily results from large stationary sources such as electric generating units and cement kilns, as described in the Montana Regional Haze Federal Implementation Plan (USEPA 2012).

PGM would provide information concerning the potential impact of oil and gas activities on AQRVs.

5.0 FUTURE MODELING

The BLM has committed to perform PGM in order to assess regional air quality and AQRV impacts. Because of insufficient monitoring and regional emissions data available during development of the RMP, PGM would not be completed prior to issuance of the RMP and the ROD. In order to complete PGM expeditiously, the BLM has begun data acquisition and PGM protocol development. When PGM is completed and the results assessed, the BLM may identify additional emission mitigation measures for oil and gas activities.

5.1 PHOTOCHEMICAL GRID MODELING

Comprehensive regional air quality and AQRV regional modeling of emission sources within the MCFO and surrounding areas requires PGM. This type of modeling can predict ozone and regional haze impacts (major pollutants and precursors can be transported for many hundreds of miles).

5.1.1 Data Acquisition

PGM requires three main types of concurrent data:

- meteorological data,
- ambient monitoring data, and
- comprehensive emission data.

The BLM's analysis determined that the latter two types of data need to be augmented and updated prior to performing PGM.

5.1.1.1 Additional Monitoring

Ambient monitoring data throughout the PGM domain (which would extend throughout most of Montana and into adjacent states) are needed in order to validate model performance, which is assessed by modeling a previous year and comparing the model's predicted concentrations to actual monitored concentrations.

In cooperation with the MDEQ, the BLM funded two new monitoring stations in north-central Montana and would provide staffing and additional funding to operate the monitors. One monitor is located near Malta in Phillips County and the other is located in Lewistown (Fergus County). Both monitors became operational in July 2012 and measure ambient concentrations of nitric oxide (NO), nitrogen dioxide, nitrogen oxides (NO_x, an ozone precursor), ozone, particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$). These data would be particularly helpful in assessing the model's ability to accurately predict concentrations of these pollutants and its ability to accurately predict regional haze and visibility impacts west of the planning area.

5.1.1.2 Updating Emission Inventories

Comprehensive emission inventories are also critically important in predicting cumulative air quality and AQRV impacts. Prior to 2012, oil and gas regional emission inventories lacked comprehensive coverage of Montana sources and also underestimated emissions of VOCs, which contribute to ozone formation.

The BLM Montana and Dakotas State Office is providing financial assistance to the Western States Air Resources Council to complete oil and gas emission inventories for the Williston Basin and the Central Montana (Great Plains) Basin. These inventories would represent calendar year 2011 emissions. In addition to covering the planning area, the inventories would include comprehensive recent emission estimates for oil and gas activity in North Dakota and South Dakota.

5.1.2 Photochemical Grid Modeling Schedule

In order to use a full 12 months of ambient monitoring data from the new Malta and Lewistown monitors, the baseline year for PGM is expected to be 2013 or a 12-month period beginning in late 2012 and ending in 2013. PGM planning began in 2012 and development of the PGM modeling protocol is expected to be completed during 2013, with modeling occurring primarily in 2014 and early 2015. Review and assessment of PGM results would be completed by Fall 2015. Table ARMP-4 provides the planned data acquisition and PGM schedule.

The Weather Research and Forecasting (or WRF) model will likely be used to model meteorological conditions and the PGM to be used will be either the USEPA Models-3/Community Multiscale Air Quality modeling system or the Comprehensive Air Quality Model with Extensions. In addition, multiple models will be used to develop and process emission inventories for input into the PGM. When modeling is completed, an air resource technical support document will be developed.

Initial PGM would include future year modeling for a year between 2017 and 2020 using emissions representing full development of BLM oil and gas resources under the selected Alternative; the specific year would be determined by the BLM based on the ability to predict future cumulative regional oil and gas emissions in the Williston and Central Montana basins. After initial PGM is completed, the BLM would begin an assessment process to determine when additional PGM may be needed. Factors to be considered in determining when additional PGM is needed include the adequacy of the adaptive management strategy to maintain good air quality, and the level of BLM-authorized oil and gas activity and emissions compared to modeled levels.

5.1.3 Air Quality Technical Workgroup and Interagency Working Group Review and Input to Photochemical Grid Modeling

Throughout the PGM data collection and modeling process, the BLM will work collaboratively with the MDEQ and the AQTW that was formed to work on this RMP, and with a other agencies or Tribes that request to be involved in the PGM effort. These collaborators provided technical review and comment on the draft modeling protocol, and would review and comment on the WRF and PGM performance evaluations, and on the draft air resource technical support document. Substantial time has been included in the schedule shown in Table ARMP-4 to allow adequate review and comment periods during the PGM process.

5.1.4 Availability of Photochemical Grid Modeling Results

Future PGM results would be presented in the final air resource technical support document and in a summary of the results. The air resource technical support document and summary document would be posted on the MCFO BLM website. In addition, the modeling protocol document will be provided via the website when the photochemical modeling air resource technical support document is made available. Outreach information regarding the availability of the results would be made through the MDEQ, AQTW, IWG, and agencies involved in the PGM process, as well as other interested parties.

5.2 LIMITED CALPUFF VISIBILITY MODELING

Through their participation under the air quality MOU, the USFWS and the NPS specifically requested that limited CALPUFF modeling be prepared between the Draft and the Final RMP. This limited modeling effort was performed and assessed direct visibility impacts from potential future BLM-authorized oil and gas sources in the northern portion of the planning area near the USFWS UL Bend Wilderness and Medicine Lake Wilderness.

The CALPUFF modeling was used as a screening tool to estimate direct oil and gas visibility impacts at Class I and sensitive Class II areas. In addition, potential plume blight impacts were assessed using the VISCREEN model. Results of these efforts are disclosed in Chapter 4.

TABLE ARMP-4.
DATA ACQUISITION AND PHOTOCHEMICAL GRID MODELING SCHEDULE

Task/Subtask	Duration (calendar days)	Start Date	End Date
Pre-Modeling Emission Inventory and Protocol Development			
Western Regional Air Partnership Williston and Central Montana Basin Inventory	426	11/1/2012	12/31/2013
Develop WRF and PGM Protocol	195	10/1/2012	4/15/2013
Base Year Modeling and Evaluation *			
WRF Modeling	142	10/1/2013	2/20/2014
Draft WRF Model Evaluation	30	2/20/2014	3/22/2014
AQTW and IWG WRF Evaluation Review	30	3/22/2014	4/21/2014
Emission Modeling (Base and Future Year) and Report	120	10/23/2013	2/20/2014
PGM of Base Year	150	2/20/2014	7/20/2014
Draft PGM Evaluation	30	7/20/2014	8/19/2014
AQTW and IWG PGM Evaluation Review	30	8/19/2014	9/18/2014
Finalize WRF and PGM Evaluations	21	9/18/2014	10/9/2014
Future Year Modeling and Evaluation *			
PGM of Future Year	150	10/9/2014	3/8/2015
Analyze Air Quality and AQRV Impacts	21	3/8/2015	3/29/2015
Draft air resource technical support document	21	3/29/2015	4/19/2015
AQTW and IWG air resource technical support document review	30	4/19/2015	5/19/2015
Finalize air resource technical support document	21	5/19/2015	6/9/2015

*** Duration and dates are subject to revision; they are estimated to provide the general timing of future modeling activities.**

Regional far-field visibility and other AQRV impact analysis for this RMP would be based on results from future PGM. Photochemical grid models are recommended for AQRV analysis of large domains in the Appendix to the MOU (USDA et al. 2011).

5.3 POST-PHOTOCHEMICAL GRID MODELING

To the extent that future emission increases are within the levels modeled with PGM or other modeling and are proximate to modeled emission locations, far-field air quality and AQRV impact analysis may incorporate by reference PGM and other modeling results. The BLM and the AQTW would determine whether previous modeling is sufficient to satisfy MOU requirements. This air quality management approach is consistent with the MOU (USDA et al. 2011) and allows for efficient air quality and AQRV impact analysis.

If additional modeling is performed after PGM is complete, an assessment of air quality and AQRV impacts would be made and, if necessary, additional mitigation measures may be identified.

6.0 MITIGATION

Air quality and AQRV impact mitigation would involve two types of mitigation:

- initial mitigation measures that become effective when the ROD is signed, and
- enhanced mitigation measures that may be identified based on future ambient monitoring data or modeling results.

6.1 INITIAL MITIGATION ACTIONS

The air quality mitigation measures described below will be applied upon issuance of the ROD through leasing documents and project-specific NEPA documents. To the extent practical, emission reductions associated with these mitigation measures have been included in the MCFO emission inventory.

1. Design and construct roads and well pads to reduce the amount of fugitive dust generated by traffic or other activities. During construction activities, apply water, apply dust-suppression chemicals, apply gravel, or use other control methods to achieve 50-percent fugitive dust control efficiency except when the ground is wet or frozen.
2. Use water or other BLM-approved dust suppression during drilling, completion, and well workover operations for dust abatement on access roads, as needed, to achieve 50-percent fugitive dust control efficiency except when ground is wet or frozen.
3. Use water or other BLM-approved dust suppression in high traffic areas during production operations for dust abatement, as needed, to achieve 50-percent fugitive dust control efficiency except when ground is wet or frozen. Operators would work with local government agencies to improve dust suppression on roads.
4. For oil and gas project plans of development (PODs), oil and gas operators would establish speed limits for project-required unpaved roads in and adjacent to the project area; oil and gas operator employees would comply with these speed limits.
5. For oil and gas project PODs, oil and gas operators would be encouraged to reduce surface disturbance, vehicle traffic, and fugitive dust emissions by consolidating facilities (e.g., using multi-well pads, storage vessels) when feasible.
6. Diesel drill rig engines greater than 200 horsepower will meet Tier 4 emission standards for non-road diesel engines. Alternatively, oil and gas operators may use drill rig engines that exceed Tier 4 emission standards if modeling or monitoring at the project level or at a programmatic level demonstrates compliance with the NAAQS and protection of AQRVs.
7. For hydraulically fractured gas wells that do not qualify as “low pressure wells”, “wildcat,” or “delineation” wells, oil and gas operators would comply with reduced emissions completion requirements specified in Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution (40 CFR Section 60.5375) within 6 months of ROD issuance.
8. Non-road diesel engines would be required to use ultra-low sulfur diesel fuel (15 parts per million weight as required by 40 CFR Section 80.610(e)(3)(iii).
9. Natural-gas-fired or electrical compressors or generators would be required at compressor stations in the PRB.
10. CBNG operators proposing a POD within 5 miles of the Northern Cheyenne Indian Reservation or the Crow Indian Reservation would be required to provide the information necessary for the BLM to conduct an analysis of air quality impacts. The BLM will use the information to determine the impact on air quality in the Northern Cheyenne Indian Reservation and the Crow Indian Reservation, disclose the analysis results and subsequent mitigation in the appropriate NEPA document, and consult with the

Tribes when the analysis shows that air quality or AQRV impacts are anticipated from a specific development proposal.

11. CBNG operators within 5 miles of the Northern Cheyenne Indian Reservation and the Crow Indian Reservation may be required to restrict the timing or location of CBNG development if monitoring or modeling by the MDEQ finds that their CBNG development is causing or threatening to cause noncompliance with applicable local, state, Tribal, and federal air quality laws, regulations, and standards, as well as state implementation plans developed by the MDEQ.

6.2 MONITORING-BASED MITIGATION

Enhanced mitigation would be evaluated and implemented if ambient monitoring data at monitors located in oil and gas activity areas within the planning area indicate that pollutant concentrations are approaching or threatening the NAQQS or MAAQS. Prior to completion of initial PGM, monitoring-based thresholds would be based on evaluation of exceedances of the NAAQS, as described in Section 6.2.1. After completion of initial PGM, monitoring-based thresholds would be based on BLM-calculated design values, as described in Section 6.2.3.

6.2.1 Monitoring-based Thresholds before Photochemical Grid Modeling Completion

Based on requests from the USEPA during the MOU review process, the BLM would review NAAQS exceedances and determine if enhanced mitigation would be warranted during the interim period between ROD issuance and PGM completion. Unless the BLM determines that enhanced mitigation is not warranted after completing specified steps (as outlined below and in Section 6.2.2), the BLM would require enhanced mitigation for BLM-authorized oil and gas activities if there is a monitored exceedance of the NAAQS at the Birney, Broadus, or Sidney monitors.

1. The BLM would notify the USEPA and the MDEQ within 30 days after monitoring data showing an exceedance has been posted on the USEPA's Air Quality System. An exceedance is defined as any monitored concentration (other than one occurring during an exceptional event) that is greater than the NAAQS, without consideration of the statistical form of the NAAQS or multi-year averaging. The notification would state that (1) the BLM requests concurrence from the MDEQ and USEPA that an exceedance occurred, and (2) the BLM would, upon concurrence by both agencies, review the exceedance according to this procedure.
2. After consulting with the MDEQ, the BLM would determine whether an exceptional event may have caused the exceedance[1].

    - If the MDEQ informs the BLM that an exceptional event likely caused the exceedance, the BLM would provide a letter to that effect to the USEPA and no further action would be necessary.
    - If an exceptional event did not cause the exceedance or if the MDEQ would not submit an exceptional event waiver to the USEPA, the BLM would perform Step 3.

3. The BLM would conduct a screening level analysis[2] to determine the likely source and location of the exceedance and whether mitigation is needed.[3]

    - If the screening analysis indicates that the exceedance was not caused by BLM-authorized oil and gas sources within the planning area or indicates that the BLM-authorized oil and gas

[1] The BLM would not formally decide that an exceptional event occurred, because this decision would be made by MDEQ. Until a final determination of an exceptional event is presented to the USEPA by the MDEQ and the USEPA has concurred, the BLM would assume that an exceptional event occurred based on a stated intention by the MDEQ to submit an exceptional event waiver.

[2] Publicly available web-based applications suggested by the USEPA to identify sources of air pollution and potential impacts include the following sites: trajectory analysis tools like HySplit (http://ready.arl.noaa.gov/), air quality data at the USEPA's air quality system site (http://airnow.gov), state regulatory agency sites and airnowtech.org, an interactive snow site (http://www.nohrsc.nws.gov/interactive/html/map.html), daily ozone modeling (http://airquality.weather.gov/), daily ozone and PM2.5 modeling site (http://www.getbluesky.org/), and daily satellite imagery site (http://ge.ssec.wisc.edu/modis-today/).

[3] If data necessary to conduct a screening level analysis is not available, the BLM would consult with the MDEQ and the USEPA regarding source attribution and the need for mitigation.

sources within the planning area did not contribute to the exceedance, the BLM would convey this finding in writing to the MDEQ and USEPA for review and comment. No further action would be necessary.
- If the screening analysis indicates that the exceedance was caused or contributed to by BLM-authorized oil and gas sources inside the planning area, the BLM would perform Step 4.

4. The BLM would consult with the MDEQ and USEPA to determine whether there is a need for a refined attribution analysis (e.g., attribution test using Comprehensive Air Quality Model with Extensions ozone source attribution technology or anthropogenic precursor's culpability assessment), or mitigation on BLM-authorized oil and gas emission sources within the planning area. If the refined analysis:

    - is warranted, the BLM would perform the refined analysis within 6 months of completing Step 3 in consultation with MDEQ and USEPA;
    - indicates that the exceedance was not caused or contributed to by BLM-authorized oil and gas sources inside the planning area, the BLM would provide that recommendation to the MDEQ and USEPA for review and comment (no further action would be necessary); or
    - indicates that the exceedance was caused by BLM-authorized oil and gas sources within the planning area, the BLM would evaluate enhanced mitigation measures as described in Section 6.2.2.

6.2.2 Determination of Enhanced Mitigation Measures before Photochemical Grid Modeling Completion

If a NAAQS exceedance occurs prior to completion of PGM and the refined analysis in Step 4 above determined that the exceedance was caused by BLM-authorized oil and gas sources within the planning area, one or more enhanced mitigation measures would be evaluated and selected by the BLM, in cooperation with the MDEQ, IWG, and AQTW, when appropriate. The geographic extent of the mitigation measure(s) would be determined based on the analysis performed under Section 6.2.1 and would be limited to the area determined to be at risk for future exceedances. Preference would be given to mitigation methods that the MDEQ intends to impose as new regulations or air quality permitting provisions. Selected mitigation measures would be implemented within 1 year after the BLM decision to apply additional mitigation.

Potential enhanced mitigation measures may include one or more of the measures listed below. Additional measures or equivalent methods or emission restrictions may be identified in the future. Potential measures include:

- drilling or blowdown activity restrictions based on meteorological conditions,
- construction activity restrictions based on meteorological conditions,
- centralization of gathering facilities,
- electric drill rigs,
- field electrification for compressors or pumpjack engines,
- plunger lift systems with smart automation,
- oil tank load out vapor recovery,
- VOC controls on tanks with a potential to emit less than 5 tons per year,
- selective catalytic reduction on non-drill rig stationary engines,
- reduced emission completions beyond those required by USEPA regulations if determined to be technically and economically feasible,
- well pad density limitations,
- a reduced total number of drill rigs operating simultaneously,
- seasonal reductions or cessations of drilling during specified periods,
- use of only lower-emitting drill and completion rig engines during specified time periods,
- use of natural-gas-fired drill and completion rig engines,
- replacement of internal combustion engines with gas turbines for natural gas compression,
- employment of a monthly, forward-looking infrared leak detection program to reduce VOCs,

- tank load out vapor recovery,
- enhanced VOC emission controls with 95-percent control efficiency on additional production equipment having a potential to emit of greater than 5 tons per year, and
- enhanced direct inspection and maintenance program.

6.2.3 Monitoring-Based Thresholds after Photochemical Grid Modeling Completion

By May 31 of each year following completion of PGM and annually thereafter, the BLM would calculate design values for each pollutant monitored at a federal reference monitor or federal equivalent method monitor within the planning area and identified as a representative monitor in Section 3.0. The design value would be calculated based on calendar year monitoring data available at the time. For pollutants requiring 3 years of monitoring data for design value calculation, data from the appropriate prior period would be used. For example, based on PGM completion in mid-2015, the first annual design value calculation would be performed by May 31, 2016, and would include monitoring data for calendar years 2013, 2014, and 2015 for 3-year design values and on monitoring data for calendar year 2015 for single-year design values.

Calculation methods would, to the extent possible, follow USEPA procedures provided in the appendices described below within Title 40 of the CFR, Part 50 in effect as of December 1, 2012:

- nitrogen dioxide (Appendix S),
- ozone (Appendix P),
- particulate matter (PM_{10}) (Appendix K),
- fine particulate matter ($PM_{2.5}$) (Appendix N), and
- sulfur dioxide (Appendix T).

These procedures may be updated by future USEPA regulations and this section of the ARMP would be revised to reflect changing regulations.

Design values would be calculated on a site-specific basis (i.e., no spatial averaging of multiple monitors). BLM design value calculations would exclude data associated with MDEQ-identified exceptional events and would be performed in accordance with USEPA regulations and guidance.

6.2.4 Determination of Enhanced Mitigation Measures after Photochemical Grid Modeling Completion

If the air quality assessment described in Section 6.2.3 indicates that a BLM-calculated design value is greater than 85 percent of a NAAQS, one or more enhanced mitigation measures addressing that pollutant or pollutant precursor would be evaluated and could be selected by the BLM, in cooperation with the MDEQ, IWG, and USEPA. The geographic extent of the mitigation measure(s) would be determined based on the analysis performed in Section 6.2.3. Potential enhanced mitigation measures include the measures listed above in Section 6.2.2 as well as additional measures that may be identified in the future. Selected mitigation measures would be implemented within 1 year after the BLM decision to apply additional mitigation.

6.3 MODELING-BASED MITIGATION

6.3.1 Modeling-based Thresholds

Future modeling would assess air quality and AQRV impacts from future BLM-authorized oil and gas activity and would include regional PGM and project-specific modeling. Modeling-based thresholds for evaluating enhanced mitigation would include potential future impacts on NAAQS or MAAQS or impacts above specific levels of concern for AQRVs in Class I or sensitive Class II areas (as identified on a case-by-case basis by MDEQ or a federal land management or Tribal agency).

6.3.2 Determination of Modeling-based Enhanced Mitigation Measures

If BLM-authorized oil and gas activity is predicted to cause or contribute to impacts above the thresholds described above, the BLM would facilitate an interagency process to ensure that a comprehensive strategy is developed to manage air quality impacts from future oil and gas development within the region. The local, state, federal, and Tribal agencies involved in the regulation of air quality and the authorization of oil and gas development would evaluate modeling results from future modeling studies and identify potential air quality concerns and necessary reductions in air emissions. If the modeling predicts significant impacts, these agencies would use their respective authorities to implement enhanced emission control strategies, operating limitations, equipment standards, or pacing of development as necessary to ensure continued compliance with applicable ambient air quality standards, including the enhanced mitigation measures listed in Section 6.2.2; other future mitigation measures identified through the BLM's adaptive management strategy; or reasonable mitigation measures suggested by the MDEQ, IWG, or AQTW. If necessary, implementation of mitigation measures would occur within 1 year of obtaining final modeling results for mitigation measures that conform to currently implemented land use planning decisions and constraints.

7.0 BIBLIOGRAPHY

Bureau of Land Management (BLM).
2007 Supplemental Air Quality Analysis to the Draft Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans. November 2007 (as revised). BLM, Miles City Field Office. MT.

Bureau of Land Management.
2008a Final Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Proposed
Amendment of the Powder River and Billings Resource Management Plans. October 2008. BLM, Miles City Field Office. MT.

Bureau of Land Management.
2008b Record of Decision for the Final Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Proposed Amendment of the Powder River and Billings Resource Management Plans. December 2008. BLM, Miles City Field Office. MT.

Montana Department of Environmental Quality (MDEQ).
2011 Email and spreadsheet from Vickie Walsh (MDEQ) to Susan Bassett (BLM). September 21, 2011.

Montana Department of Environmental Quality.
2013
State of Montana Air Quality Monitoring Network Plan. May 2013. MDEQ, Air Resources M anagement
Bureau. Helena. http://deq.mt.gov/AirQuality/AQInfo/PDF/MT_2013_NETWORK_PLAN.pdf.

United States Department of Agriculture, United States Department of the Interior, and United States Environmental Protection Agency (USDA, USDI, and USEPA).
2011 Memorandum of Understanding Among the U.S. Department of Agriculture, U.S. Department of the Interior, and U.S. Environmental Protection Agency, Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions Through the National Environmental Policy Act Process. June 23, 2011. Available at: http://www.epa.gov/oecaerth/resources/policies/nepa/air-quality-analyses-mou-2011.pdf.

United States Environmental Protection Agency (USEPA).
2012 Approval and Promulgation of Implementation Plans; State of Montana; State Implementation Plan and Regional Haze Federal Implementation Plan. Docket No. EPA-R08-OAR-2011-0851. August 15.

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